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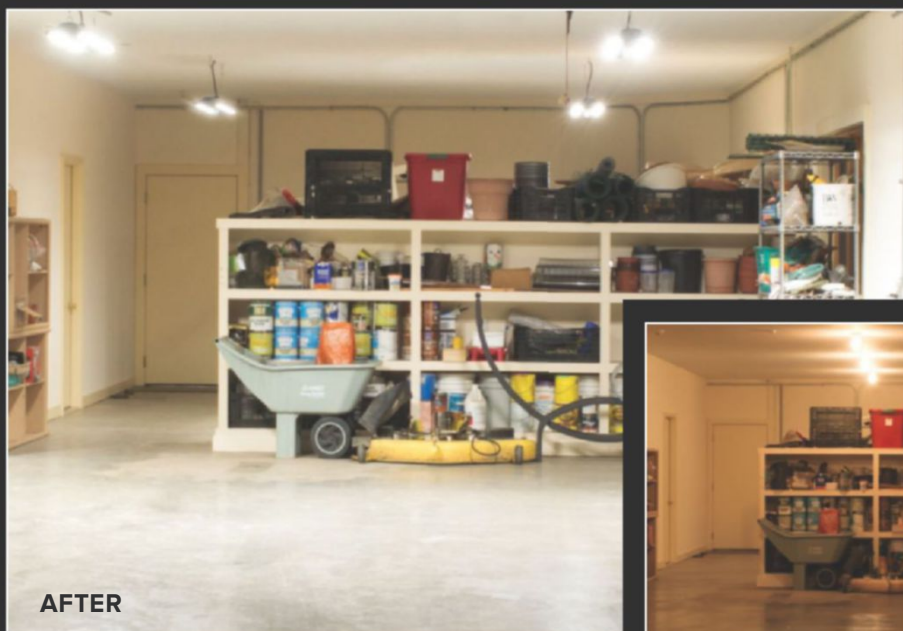


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# SHOP TALK



## DECEMBER IN THE JUNKYARD

I go to junkyards for fun. Half the time, I'm not looking for anything in particular—just seeing what's there. I went the day I wrote this, in fact, on my way back from a photo shoot. Why? Because I had time to kill, and it was on my way. My friends and family think I'm crazy—well, most of them do. Why wouldn't they? I mean, they're dirty, they're in rough neighborhoods, and it's just a bunch of broken-down cars, right?

Speaking pragmatically, I go to the junkyards to find things that are too expensive to buy new or to buy things that are no longer available. Part of the appeal is in the search and the rush upon finding it. When I owned my 1986 Chevrolet Caprice coupe, I scoured the local yards nearly every weekend looking for an intact dashpad to replace my cracked and fissured one. I got so good at spotting Chevrolet B-bodies that I didn't even need to walk each isle; I could just scan the rows and pick them out.

It took about six months, but I finally found a replacement dashpad, and it was mint. All the while, though, I'd been collecting parts from the dozens of Caprices and Impalas I was *hoping* had good dashpads. Parts like the pair of cool-looking bumpers without

the big, plastic rub strips; a headliner that wasn't sagging; a spare pair of taillights; new headlight bezels; or thin rocker-panel trim to replace my car's gaudy, wide trim. Once, I even spotted a low-option Impala with a non-AC heater box. Unfortunately, I didn't have any tools with me that day—what a score that would have been. It was the only one I've ever seen, too.

I also go to junkyards to learn about cars. Think about it, virtually every mainstream car is there in some stage of disassembly, and it only costs \$2 to walk in and look at them. I've inspected the overhead cam and valvetrain systems of Ford, Honda, and Toyota. I crawled under a Honda Prelude with a four-wheel steering system. I've studied transaxles in Corvairs and Beetles, rocker arms on a SOHC Zetec engine in a Ford Focus, and funny-looking air-flow flapper doors on Mercedes-Benz V8s. It's a good place to be inspired by what you see. Lately, I've had a strange desire to grab a DOHC Lexus V8 just to take it apart and rebuild it.

This may seem strange, but I also see chunks of people's lives in the things left behind in these cars. Nearly every one bears some mark of its owner, providing a snapshot of the

waning moments of that car's life.

Much of it is mundane—like gasoline and grocery receipts—but I'll occasionally run across more interesting stuff, from unpaid tickets and overdue bills to dirty magazines and what I'll politely refer to as revealing clothes.

We don't think about it much, the personal stake we have in these cars. For every one car sitting on stands in this Pick-A-Part, thousands of hours went into its design, hundreds of hands touched it on the assembly line, and someone bought it from a dealership. Hopefully, that person cared for it as best as he or she could, but like everything, the car wore out or became neglected, abused, and no longer served its purpose. I'm often struck by sadness at this notion, even though it is the way of things. I have some old cars, and I want to stall the inevitable for as long as I can.

—John McGann

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# HORSEPOWER!

## BIG-BLOCK IN A FORD

Josh Ames / Vienna, IL

What does it take to run 5.15 at 140 in the eighth-mile in a 3,300-pound Mustang? "About 1,430 hp at the rear wheels," Josh Ames says. He bought his 1993 Fox Mustang when it had a 302 and a 76mm turbo on it, but it wasn't fast enough. "The car went 7.20 at 98 mph before we dropped the big-block into the car."

Josh found a used-but-complete Scott Shafiroff 555-inch big-block on RacingJunk.com, then sent it out to Midwest Engines for a checkup, and plunked it into the Fox Mustang for some drag racing. When we found him, he was clicking off 5s at our Midnight Drags event at the I-57 Dragstrip in Benton, Illinois.

By Douglas R. Glad / Photo: Wes Allison

There is a MagnaFuel 500 fuel pump mounted on the frame in the trunk. The system is return-style with a regulator for each NOS fogger, and an additional one for the carburetor.

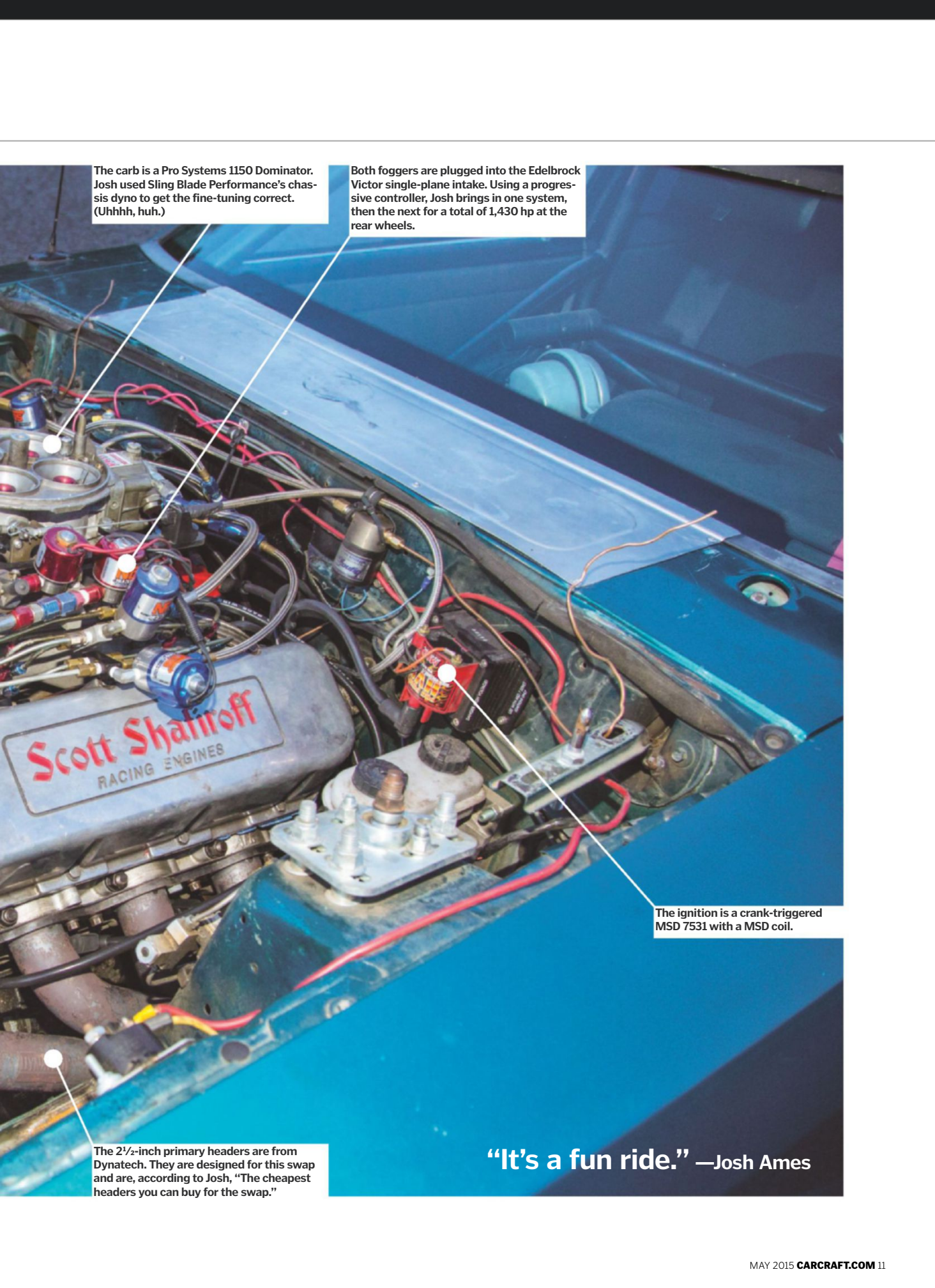
On the left is an Aerospace vacuum pump to scavenge the crankcase. In the center is a CSI electric water pump.

The cam is a custom nitrous grind from Comp with "about 0.850 lift" and 294 degrees of duration at 0.050.

Josh told us that the AFR 357 heads are the go-to for nitrous builds at Shafiroff. The final static compression ratio is 14.0:1, requiring a lot of Renegade 120 racing fuel.

The motor plate was made by Josh in his garage, "Out back behind my house."





The carb is a Pro Systems 1150 Dominator. Josh used Sling Blade Performance's chassis dyno to get the fine-tuning correct. (Uhhhh, huh.)

Both foggers are plugged into the Edelbrock Victor single-plane intake. Using a progressive controller, Josh brings in one system, then the next for a total of 1,430 hp at the rear wheels.

The ignition is a crank-triggered MSD 7531 with a MSD coil.

The 2½-inch primary headers are from Dynatech. They are designed for this swap and are, according to Josh, "The cheapest headers you can buy for the swap."

**"It's a fun ride." —Josh Ames**



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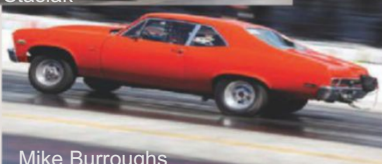


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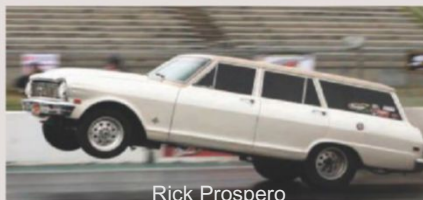
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# BOLT-ON EFI FOR BLOW-THROUGH APPLICATIONS

By Douglas R. Glad / Photos: Douglas R. Glad



Shannon Hudson is the owner and operator of Redline Gauge Works in Newhall, California. The Valiant is a 1969 with a 360-inch LA small-block, flat-tappet cam, 9.0:1 compression, cast pistons, and ported "J" heads.

➔ If you are reading this because you have a blow-through turbocharger or belt-driven supercharger on your carbureted V8, we have the cause and solution for your problems. Blow-through supercharging means your boost toy delivers air through a carb hat and into a carburetor. Fuel is introduced and delivered as an atomized mixture to the intake manifold runners, then finally through the intake valve, and into the cylinder.

Problems occur when the system begins to produce boost. Forced air pressurizes all of the parts of the carb that were not designed to see pressure. Forced air affects the floats, the throttle shafts, and the air/fuel ratio.

Float bowls use a needle and seat to control the amount of fuel that enters the bowl. The average fuel pump creates 7 psi of fuel pressure to lift the needle off the seat and fill the bowl with fuel. Once boost reaches 7 psi, fuel stops flowing. The solution is a

boost-referenced fuel-pressure regulator that adds fuel pressure at a 1:1 ratio. We've also heard that boost pressure in the bowl can crush plastic floats, requiring brass replacements.

When you pressurize throttle shafts, the pressure will force air and fuel past the bushings, causing a leak. Boost leak isn't the problem here—rather, it's the fuel dripping on a hot manifold.

The last and likely the worst problem is the primary and secondary jetting required to maintain a safe air/fuel ratio



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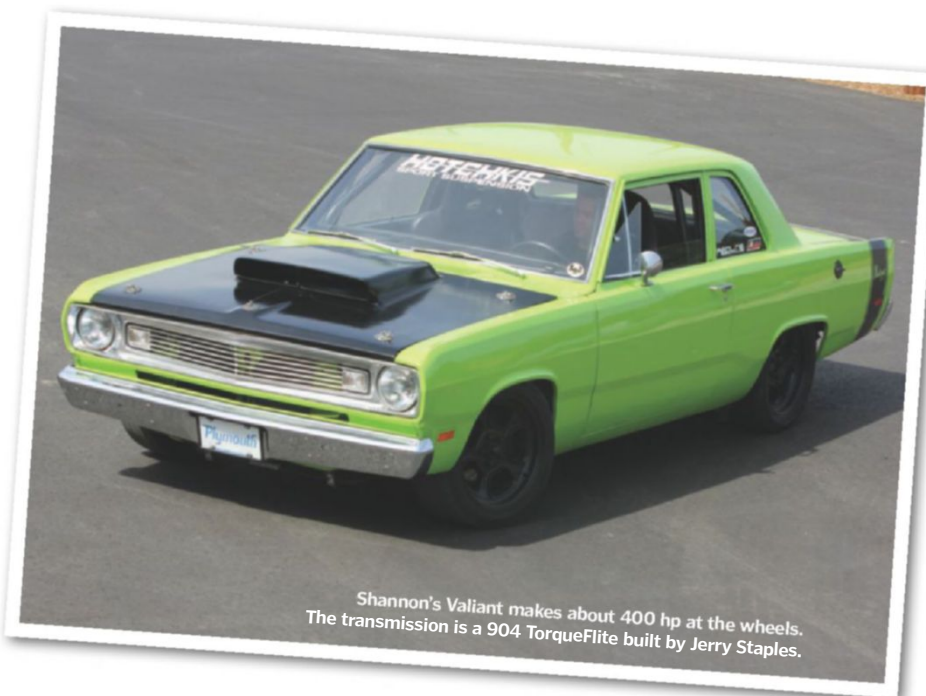


at wide-open throttle (WOT). A 750-cfm carburetor usually has 72 jets in the primary side. We've seen 10 or more additional jet sizes in both the primary and secondary to maintain a safe air/fuel ratio at higher engine speeds and boost levels. With such huge jets, the midrange and cruise ratios are often 10.0:1 or richer, making the part-throttle response and fuel economy suffer. In extreme circumstances, the primaries will be so lean and secondaries will be so rich to compensate, that the corresponding cylinders will also be rich or lean. To be fair, this can be controlled with specialized power valves that deliver enrichment fuel at different boost levels, but it requires either a specialized carburetor or a blow-through expert to modify what you have. Big boost numbers will also drag fuel from one booster to another inside the carb hat, causing individual intake runners to starve for fuel.

Fuel-injection systems don't have float bowls, jets, or power valves, so idle and midrange air/fuel ratios can be controlled more effectively and WOT fuel enrichment is handled by a

computer instead. What you get is a more stable fuel curve and better idle and midrange throttle response, better mileage, and hopefully, more usable power. We tested Holley's Terminator

EFI on Shannon Hudson's 1969 Plymouth Valiant with a blow-through Paxton supercharger. It ran poorly for a long time, and then it ran great. Here's how he did it.



Shannon's Valiant makes about 400 hp at the wheels. The transmission is a 904 TorqueFlite built by Jerry Staples.



The supercharger is a Paxton Novi 1200 that Hudson picked up two years ago and installed himself. The system blows through a Holley 750 double-pumper using a Paxton Power Hat. The system makes about 5 pounds of boost.





You can already see a couple of things that were going on with the blow-through carb setup. The primaries are black from a rich air/fuel ratio and we are guessing a few backfires. The jetting combo was a whopping 80 primary and 91 secondary.



The intake is a Mopar M1 single-plane manifold that was on the original build. We've had luck with the Edelbrock RPM Air Gap for its superior fuel distribution and torque output, so we might have to try one in the future.

The Terminator EFI is a direct swap for any 4150-style square-flange carburetor. The stock linkage and aftermarket return springs were an exact fit.

This is a direct replacement for your 600-950-cfm carburetor. The 80-lb/hr injectors can handle 250-600hp engines. It plugs into your factory or aftermarket distributor with a Holley harness adapter and uses factory-style sensors and connectors for easy service.







Here you can see the original linkage and transmission kickdown for the 904 bolted directly to the throttle-body.



Hudson had a Fuel Lab pressure regulator from the previous installation. The transducer is for the electronic fuel gauge inside the car. Holley offers both a boost-referenced regulator and a complete fuel system that includes billet filters, stainless hose, fittings, and a billet fuel pump if you need it.



Bar is a fancy word for around 14.7 pounds of air pressure, or one atmosphere. A 2-bar map can read up to 30 psi, a 3-bar 45, and so on. The MAP communicates that information to the self-tuning ECU.



To use the 3-bar MAP, Hudson needed to load a program to recognize the change. This can be done via Wi-Fi by a Holley service technician.





Hudson used a dual-feed pressure regulator that feeds from the fuel tank to twin ports, and then out to the throttle-body. Note the crossover to equalize the pressure, it came with the kit. The system is designed for 45 pounds of fuel pressure



Everything is included. The power wire needs to go directly to the battery to properly power the ECU and to reduce electronic noise that will interfere with its operation.



Yes, there is a port for your power brakes, and yes, there is a port for your vacuum advance.



Redline Gauge Works builds custom dashboards and can make virtually any gauge. These gauges are customized fuel level, volts, water temp, oil pressure, and a GPS speedometer from Speedhut. Hudson can create any font and any face for almost any gauge.



The fuel gauge is isolated at the regulator so there is no pressurized fuel anywhere near the driver. The boost gauge uses a transducer to relay information to the ECU and back to the gauge.



## PARTS LIST

DESCRIPTION	PN	PRICE
Terminator EFI 4-bbl	550-406	\$2,049.95
3-bar MAP	554-107	83.95
Inline fuel system	526-4	399.95

## →SOURCES

**Holley;** [Holley.com](http://Holley.com)

**Redline Gauge Works;**  
[RedlineGaugeWorks.com](http://RedlineGaugeWorks.com)

**Speedhut;** [Speedhut.com](http://Speedhut.com)



Originally, Hudson used a Walbro 255 mounted on the frame and connected to the factory fuel-tank pickup modified to have a return line. On hot days, the return system would heat the fuel and the pump, causing a drop in fuel pressure. The new tank is from Hot Rod City Garage in San Bernardino, California. It was built to order with an in-tank pump. Holley recommends the pump deliver 255 lph or 400 lb/hr at 45 psi minimum. **END**





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# COATED

## How to Paint a Car with ElastiWrap

By Kevin Tetz / Photos: Kevin Tetz

→ ElastiWrap is a multi-purpose, rubberized, removable coating that can be sprayed, rolled, or brushed onto almost any surface. Coating systems like this have been around for a while, but this one is much improved over other brands and versions of temporary coatings. ElastiWrap is the only one with an intermix system that lets you come up with your own colors, and it

is the only one that is 50-state legal—it can be shipped to and legally used in California, based on its pollution standards.

What does this have to do with the 1994 Mustang in these pictures? Well, the paint was last on its owner's to-do list, and having just paid for a tuning session with DBR High Performance in Spring Hill, Tennessee, he's got to save some money for a traditional paintjob.

We wanted to show that ElastiWrap can bridge the gap between spending the time, energy, and money on a "real" paintjob and driving around in a vehicle that looks like warm poo. Check out this quick project that cost us a couple hundred bucks, took about six hours of our time, made an amazing difference to the overall appearance of this pony, and buys the owner some time to save some up for the paintjob.







The paint on this 1994 Mustang is typical of OE paint from the mid-1990s. It's flaking badly and is too far gone to be saved with polishing. The best way to correct this problem is to disassemble all the trim pieces and strip the paint off and repaint on bare metal. This costs a lot of time and money, whether you're farming it out or you're a DIY hero in your own garage.



ElastiWrap has an intermix system that allows you to make your own colors. It is also available in a variety of colors straight from Eastwood, so you can use pre-mixed colors like we're doing here: Torqued Yellow, Burnout Black, and Clear. We are also using Eastwood's surface prep and cleaner. Mineral spirits will help you with cleanup, as well as safely thin the consistency of ElastiWrap if you're spraying it through a smaller fluid tip in your paint gun.



If you decide to spray it, Eastwood's Evolution HVLP gun offers a wide variety of fluid tip sizes that are perfect for ElastiWrap. We recommend a 1.8 tip size, but you can spray with as small as a 1.4 (you will most likely need to thin the material, in that case).



Although you can roll or brush ElastiWrap, another option is to use an electric turbine sprayer. This unit can be bought as a "bundle" package from Eastwood for less than \$70. Even though it's plastic and has a slightly "less expensive" feel, this one has worked flawlessly for several large jobs, and with minimal maintenance and thorough cleaning, it has always been ready to go.



Masking is masking, whether for a traditional paintjob or a peel-off coating. The more precise your masking is, the better the end result will be.

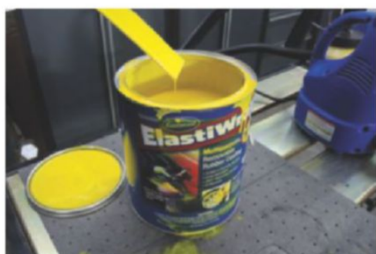




Be sure to use Eastwood's surface prep and cleaner. It does two things: it cleans the surface of debris and sets up the surface for easier removal (peeling) of ElastiWrap when you're ready to take it off.



Eastwood recommends shaking the cans before opening, but a thorough stirring will blend settled materials if you don't have access to a paint shaker.



The Torqued Yellow is certainly vivid and will give a nice contrast to the black convertible top and silver wheels.



The second, third, and fourth coats go on easily, and although it looks a little lumpy coming out of the gun, ElastiWrap self-levels nicely on the panels. Use a minimum of four coats of ElastiWrap. This builds enough depth and film strength that will make the coating easier to peel off when the time comes.



We're giving our Pony an accent that takes advantage of the style lines in the hood and fascia. Note that we're using low-tack, blue "painter's tape" to keep from pulling up the ElastiWrap. The vinyl, 1/4-inch, fine-line tape has a low enough tack that it can give a crisp line against the two colors and not pull up any undercoats.

With our graphic outlined, we mask the surrounding panels to protect them from overspray, even though the turbine sprayer hardly produces any.



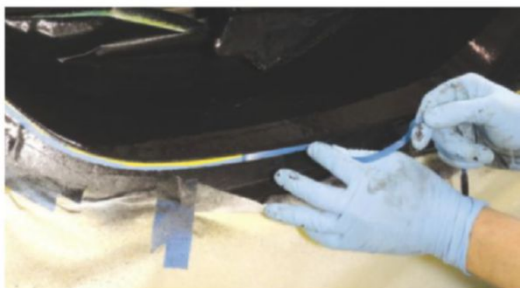
Cleaning the gun thoroughly with mineral spirits is very important and will keep the colors pure. Burnout Black is the color of choice for the accent stripe.



Unlike the yellow, black *does* cover in one coat, so there was no need to go back over it with a second coat.



We decided to shoot a coat of clear ElastiWrap on top of the black to offset the cool matte finish of the yellow with a shiny black.



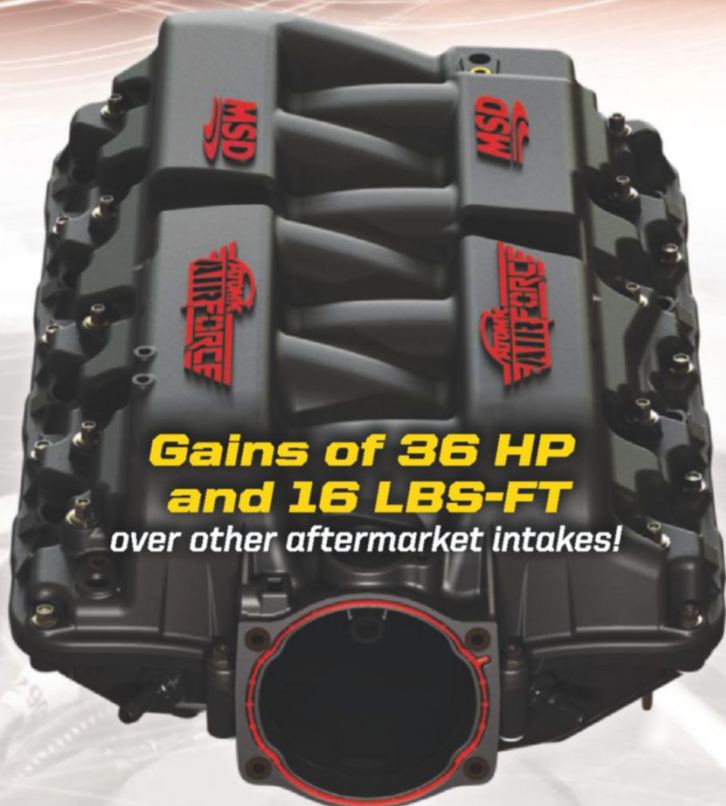
Remove the fine-line tape while the coating is still wet so it cuts a crisp line into the black without pulling the yellow up.

Any time you're spraying a light color over a dark base, even with traditional paint, you'll never have complete coverage in one coat. The first coat looks splotchy, but concentrate on your technique, giving 50 percent overlaps on each pass and making it a smooth and even coat.



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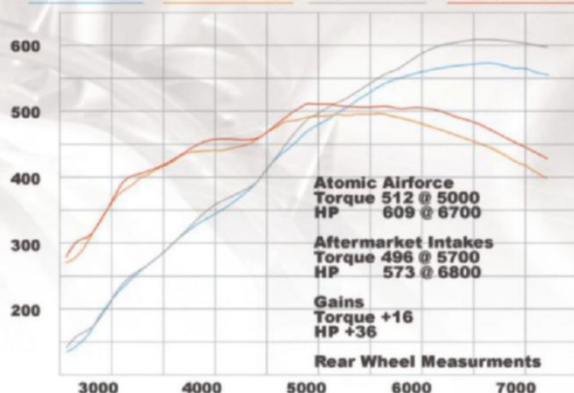


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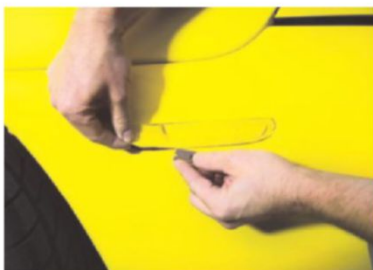
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If you make a mistake, a little mineral spirits on a rag will quickly remove any overspray or masking boo-boos. Be careful and blot it rather than soak the panel.



Unmasking the rest of the car is relatively straightforward, but you may have to cut the ElastiWrap with a razor blade while unmasking if it bridges a seam.



Touch-up with a modeling brush works great if some of the coating peeled from the edges while unmasking.



No, it's not perfect, but it's cool! The matte finish is actually current, and the way it lifts the appearance of the vehicle is exactly what we had hoped for.





Next, we wanted to try something that has been discussed online: spraying automotive clearcoat over ElastiWrap to give it solvent resistance and stain resistance to gasoline and other chemicals. This fender has been sprayed with four coats of clear ElastiWrap with some bass boat flakes mixed in.



Using Eastwood's High Gloss 2K Aerospray catalyzed clear, we wanted to see if we could make this temporary coating into a semi-permanent coating that could still be removed.



We applied two wet coats of the catalyzed clear on and let it sit overnight.

## CONCLUSION

With the investment being a fraction of what a traditional paintjob would be, we've got a great-looking Mustang again and have the option of leaving it just like it is indefinitely, or peeling it off when we're ready to move to the next step of a traditional respray. This coating can be added to or touched up without any additional prep, so if we want to spray more accent stripes, flakes, glitter, or pearls, we can just work on top of what's there. ElastiWrap does what it says it will do: give us an alternative that is less expensive and a lot of fun to spray that doesn't take a ton of expensive equipment to use.



Yes, the traditional clear paint peels the ElastiWrap off of the fender and takes 90 percent of the flakes with it. This opens up many possibilities when it comes to fuel resistance on motorcycle or ATV fuel tanks, or even aesthetic styles that one might want to use with a mix of professional coatings and ElastiWrap—all of which can be removed easily when you're done. That's pretty cool stuff! **END**

## →SOURCE

The Eastwood Company;  
800/343-9353; Eastwood.com

## PARTS LIST

DESCRIPTION	PN	SOURCE	PRICE
Torqued Yellow (quart)	15082ZP	Eastwood	\$29.99 (qty. 7)
Burnout Black (quart)	15074ZP	Eastwood	29.99
Matte clear (quart)	15250ZP	Eastwood	29.99
Surface prep	14933Z	Eastwood	9.99
Turbine paint gun	14878	Eastwood	69.99
Mineral spirits (gallon)	15287ZP	Eastwood	19.99
Masking tape, 3/4-inch	51515	Eastwood	5.99
Fine line tape	37166	Eastwood	10.99
<b>TOTAL</b>			<b>386.86</b>



# EDELBROCK EXTRA EDITION

## An Exclusive Look at Edelbrock's New Performer RPM CNC for Pontiac V8

By Rocky Rotella / Photos: Rocky Rotella

→ Edelbrock is keeping the Pontiac performance flame glowing. In addition to the wide array of intake manifolds developed over the years, the company was the first to mass-produce a high-flow, cast-aluminum cylinder head in the mid-1990s, and it has arguably been the most popular aftermarket casting in its time. Edelbrock has since introduced a cast-aluminum Performer D-port in 2011, and in 2014 it revised its original round-port casting to create the Performer RPM CNC. Follow along as we take a closer look at the company's latest release and learn more about its development from company insiders.







Where Pontiac performance enthusiasts were otherwise forced to hunt down and modify rare round-port cylinder heads, Edelbrock changed the industry in 1995 with the introduction of its cast-aluminum Performer RPM. Featuring a round-port exhaust configuration and an as-cast intake port capacity of approximately 280 cfm, it continues to sell very well. A new version of the same casting is available with CNC-machined, heart-shaped combustion chambers.

## PONTIAC BASICS

Pontiac purists have coveted the division's round-port cylinder heads for years. Introduced on the 1968½ Ram Air II, the round-shaped exhaust outlets were intended as a convenience for racers looking to fit tubular headers. According to the late Malcolm McKellar—famed Pontiac engineer renowned for taking the division's V8 performance to the next level during the late 1950s and early 1960s—internal testing revealed that the round exhaust outlet didn't actually improve airflow when compared to the typical oval-shaped outlets used on all other Pontiac V8s up to that point. Instead, the internal-port changes accompanying the

new shape were responsible for the peak exhaust flow boost of some 20 cfm at 28 inches of pressure.

The round-port cylinder head was further revised for the 1969 Ram Air IV, where its intake ports were enlarged by 10 percent, increasing peak intake airflow capacity at 28 inches from approximately 210 cfm to nearly 235. The Ram Air IV casting was carried over with minimal changes for 1970. The high-winding, 400-inch mill, complete with a 0.520-inch-lift camshaft and a compression ratio pushing 10.25:1, proved a formidable contender on the street and dragstrip in the limited number of

GTOs and Firebirds in which it was installed in those years.

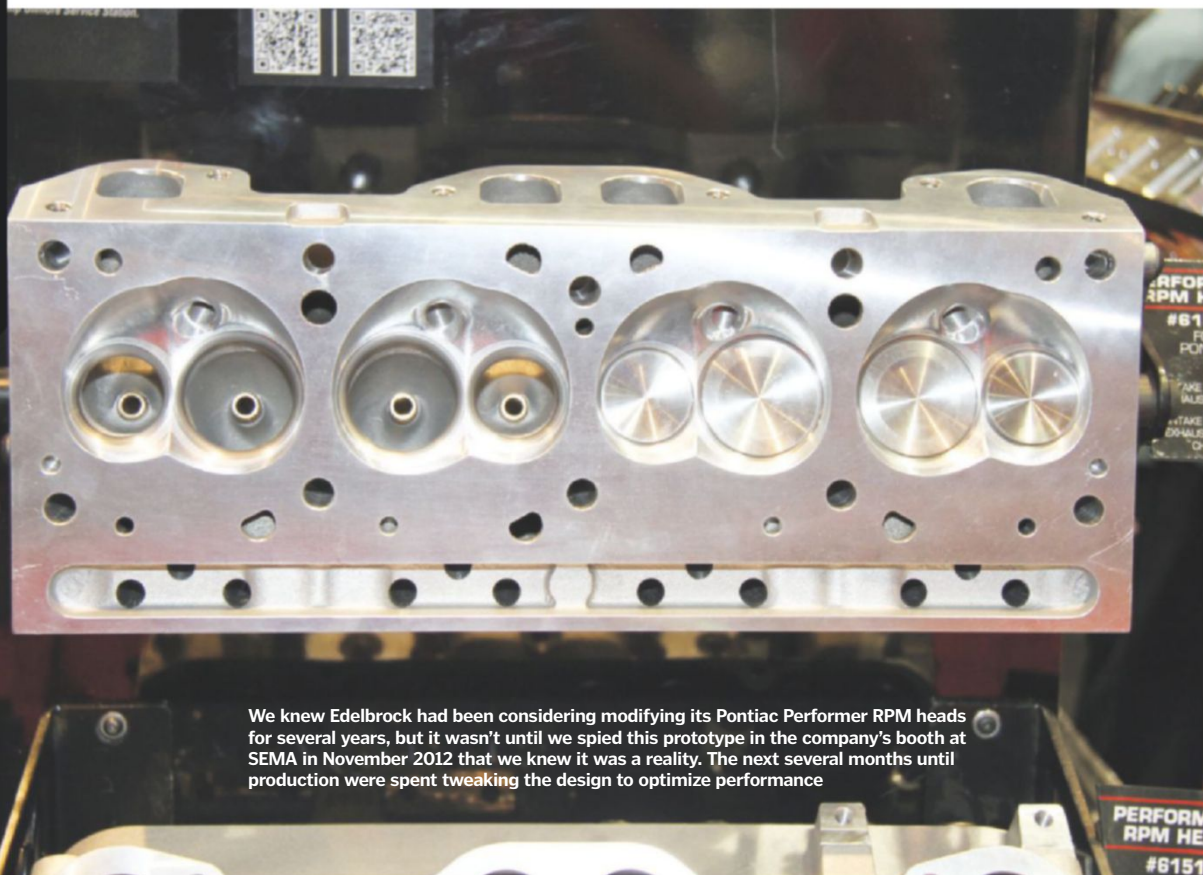
When General Motors mandated a maximum compression ratio of 8.5:1 for its division's engines in 1971, Pontiac offset the pending performance loss by increasing displacement, and the Ram Air IV evolved into the stump-pulling 455 H.O. The 1971-1972 455 H.O. utilized a modified version of the R/A IV cylinder head with similar intake and exhaust airflow capacity, but its combustion chamber volume increased from 72cc to 111 to accommodate the 455's now-advertised 8.4:1 compression ratio. When the Super Duty 455 debuted in midyear 1973, its intake and exhaust ports were reshaped to maximize airflow, but the casting retained the same round-port exhaust configuration as well as 111cc combustion chambers.

In a time before aftermarket cylinder heads were commonly available, Pontiac performance enthusiasts had no other choice but to seek the original round-port cast-iron offerings for obvious reasons. The desire for a compression ratio of more than 10:1 revealed 455-spec unit's obvious shortcomings. The 111cc combustion chamber volume was simply too large to attain an appreciable compression ratio on any 400 or 455 without excessive milling and/or the use of domed pistons. The 72cc chambers made the R/A IV head the preferred choice for racers, and once the restoration crowd begun seeking them for their projects, the value of a virgin set shot skyward.



Not to be confused with the Performer D-port (shown), which Edelbrock released in 2011, the new Performer RPM CNC is a modernized version of its original round-port cylinder head design. The D-port casting has a CNC-machined chamber as well, though it's slightly different than the Performer RPM CNC.





We knew Edelbrock had been considering modifying its Pontiac Performer RPM heads for several years, but it wasn't until we spied this prototype in the company's booth at SEMA in November 2012 that we knew it was a reality. The next several months until production were spent tweaking the design to optimize performance

## ENTER EDELBROCK

Edelbrock Corporation in Torrance, California, has been producing high-performance intake manifolds for Pontiac V8s since the 1950s. It had been producing aftermarket cast-aluminum cylinder heads for several years, too, but not where Pontiacs were concerned. "During the mid-1990s, we recognized a large demand for a high-flow Pontiac cylinder head," says Smitty Smith, Edelbrock's technical sales coordinator. "We teamed with Ken Crocie of H-O Racing to develop a cylinder head patterned after Pontiac's desirable R/A-IV casting and introduced our Performer RPM in 1995."

According to vintage Edelbrock literature, the Performer RPM cylinder head for Pontiac V8 was specifically developed to satisfy the performance requirements of street enthusiasts and drag racers alike. "Maintaining the deck, intake, exhaust, and valve-cover flanges in the stock locations allowed us to offer a cylinder head that would install easily on virtually any Pontiac V8 block from 1962 forward with a bore diameter of 4.06 inches or greater," Smith says. "The intake ports remained

in the stock positions, which allowed the use of any factory or aftermarket intake manifold. In as-cast form, airflow capacity was greater than what most could achieve from any max-ported

Ram Air IV casting, and it offered plenty of potential for significant flow increases for those desiring it."

The document reveals that Edelbrock originally considered D-shaped exhaust

Photo: Courtesy of Edelbrock



Much development work went into perfecting the chamber's shape. Because of CNC machining, consumers are rewarded with a chamber that's virtually identical from cylinder to cylinder. How is Edelbrock able to ensure that? This digitized program is the answer.



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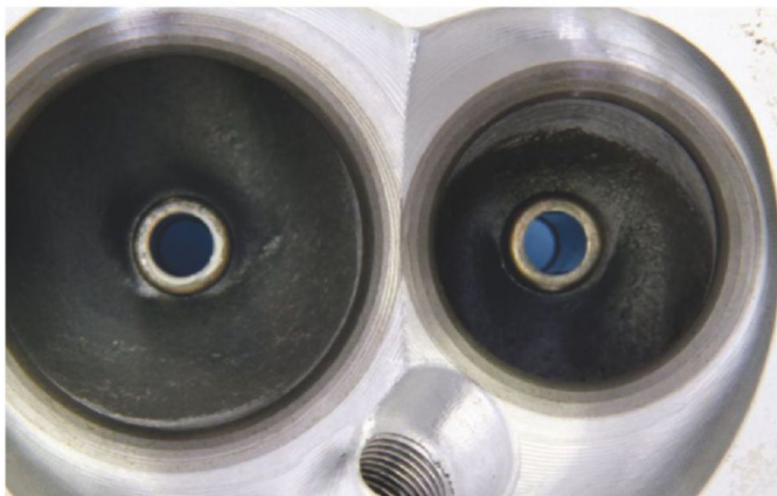




When Edelbrock released its Performer RPM in 1995, the combustion chamber resembled the scallop-shaped, wedge-type chamber that Pontiac utilized. Unlike the stock units, Edelbrock biased the plug toward the exhaust valve, which not only allowed for exhaust port enhancements, it also centralized its position in the chamber for improved combustion efficiency. Edelbrock still offers this cylinder head in 72- and 87cc variants.



Edelbrock's new Performer RPM CNC for Pontiac V8 features a fully machined combustion chamber with a pronounced heart shape. It's easy to see how this chamber differs from the scalloped-shaped chamber of the Performer RPM. Notice that the spark plug has been relocated to further enhance combustion efficiency with a chamber of this shape, which can further lessen total spark lead requirements. Edelbrock offers the CNC-machined chamber in 72- or 87cc volumes.



The fully CNC-machined combustion chamber design essentially eliminates the transition from the chamber to the valve seat, which can not only show a minor flow improvement when compared to a scallop-shaped castings, it tends to better control fuel through the transition as well.

ports simply because it recognized that configuration was most common to Pontiac V8s and it might prevent the need for customers to purchase new headers or reproduction exhaust manifolds. Because of durability concerns in the common wall of the center ports at the time, however, it ultimately decided on the round-port configuration, which isn't susceptible to the malady, and just as Pontiac found, it made fitting headers easy. "It's interesting to note that alloy composition and casting techniques have obviously reached a point where it's no longer a concern, as proven with our Performer D-port," Smith adds.

The production Performer RPM cylinder heads feature 2.11-inch intake and 1.66-inch exhaust valves. While original high-performance Pontiac castings were factory-equipped with 1.77-inch exhaust valves, Edelbrock found that with a properly designed port, it could achieve more exhaust airflow than a factory casting despite the smaller valve, and it could improve scavenging and combat reversion in certain applications as well. "The exhaust valve is moved 0.060 inch farther away from the intake valve, which resides in the stock position. The spread allows for the installation of oversized 2.19/1.77-inch valves if airflow demands require," Smith says.

Intake-port volume measures 215 cc, while exhaust-port volume measures 175 cc. According to Edelbrock's published information, peak airflow at 0.600-inch lift and at 28 inches of pressure measures approximately 286 and 200 cfm, intake and exhaust, respectively. Having the chance to flow a number of Performer RPM castings on our own flow bench, we can verify that Edelbrock's claim is well within reason.

Pontiac hobbyists quickly found that the Performer RPM was capable of producing 500 hp in as-cast form on a relatively mild 455. Professional builders learned that intake airflow of more than 300 cfm was easily attainable with mild porting, and up to 330 cfm was possible with moderate effort. For maximum performance applications, the Performer RPM is versatile enough that it can provide as much as 370 cfm when widening the ports enough that pushrod relocation is required.

The Performer RPM has been an excellent seller for Edelbrock. Since its introduction, the only major change was to those produced after March 15, 2002. "We were using stock-length



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bolts to fasten the cylinder head to the block in most locations,” says Rick Roberts, Edelbrock’s director of engineering. “We found one aluminum casting boss was located too closely to a water jacket and it wasn’t taking head-bolt pressure well in certain applications. So we revised the boss to make it thicker, successfully increasing its integrity and durability. A new head-bolt kit is required for castings produced after that date, but beyond that, we haven’t needed to make any other changes. It continues to sell very well for us.”

## CHAMBER CHATTER

In today’s new-car market, cylinder heads with combustion chambers containing a heart-shaped appearance are commonplace. “The chamber shape tends to improve combustion efficiency,” Roberts explains. “Any wedge chamber, heart-shaped or scalloped, offers a natural motion called axial rotation [or swirl] that sweeps the air/fuel mixture toward the exhaust valve side of the chamber. By creating a chamber shape and locating the spark plug properly to accentuate combustion with axial rotation in mind, we can greatly enhance the combustion process.”

Improved combustion efficiency creates quicker pressure rise within the cylinder. “The faster cylinder pressure rises, the less spark lead that’s required for complete combustion. Past experience with it tells us that 4 to 6 degrees less is common, but there are just too many variables to make a blanket statement. The faster rise also translates into improved piston push, which tends to result in greater torque output. While mixture stoichiometry generally remains the same, a heart-shaped chamber tends to improve the air/fuel-ratio curve because the burn is more complete. So it’s quite possible to run the mixture slightly leaner when compared to a conventional wedge-shaped chamber,” Roberts says.

The double-quench design typically associated with a heart-shaped chamber tends to maximize combustion by initiating spark where the mixture is densest, allowing the flame to consume as much as fuel as possible in the shortest amount of time. Where production vehicles are concerned, the improved efficiency can also lead to reduced tailpipe emissions, but it’s the other distinct operational advantages—as well as the marketing ability—that pushed many companies into

introducing aftermarket cylinder heads with a specially designed chamber of some sort during the mid- to late-1990s. Edelbrock’s first foray into a designed combustion chamber was in 1996 with the small-block Ford offering. The design was so well received that Edelbrock begun updating many popular makes over the next several years.

Shortly after introducing its first designed combustion chamber, Edelbrock found that it could improve upon its design by automating the process using CNC equipment. Roberts explains, “Sand casting allows for some degree of variation and core

shift from run to run. The precision machining associated with the CNC process tends to improve flow consistency from port to port on a given cylinder head, as well as from production run to production run. A cast chamber also has some limitations where it interfaces with the valve seat. Our CNC chamber has a machined transition from the valve seat into the chamber, and that tends to improve airflow by a few cfm throughout the entire flow range. We’d also found that in instances where flow can ‘back up’ at high lift on a cast chamber, it is sometimes eliminated with a CNC-machined chamber.”

## MODERNIZING A STANDARD

Though its Performer RPM for Pontiac V8 was selling quite well, the company reached the point where it began considering updating its chamber for a combination of reasons. “We released our Performer D-port in 2011 and it featured a modern heart-shaped combustion chamber,” Roberts explains. “The new cylinder head has been quite successful for us and almost immediately consumers begun asking if we could update the round-port head similarly. We recognized the opportunity where we could modernize a cylinder head that historically sold very well for us, and based on similar changes we made to other makes, we knew it would be an upgrade.”

The Edelbrock team went to work modernizing its Performer RPM. The plan was to make no other changes to the casting beyond the addition of a CNC-machined, heart-shaped chamber. The overall shape of Edelbrock’s new CNC-machined chamber is a proprietary design that was developed internally and continually improved over time. “The basic shape of the Pontiac chamber was inspired by the success we’ve found with other wedge-shaped, angle-plug cylinder heads in our lineup. We then varied it to make it compatible with the typical bore sizes of the Pontiac V8, intake and exhaust valve sizes and locations, and placement of the spark plug. Altering the water jacket to allow for optimal placement of the spark plug was the only modification needed to accommodate the revised chamber,” Roberts reports that it has no effect on cooling.

Like the original Performer RPM casting with its scalloped chamber, the Performer RPM CNC is available in two

volumes: 72 and 87 cc. While the same basic casting is used for both applications, the larger combustion chamber is achieved by machining it some 0.120-inch deeper into the deck surface, and that places the intake and exhaust valve seats higher in relation to the port floor, which subsequently negatively affects airflow by some 10 to 15 cfm each. “We considered offering additional volumes, but we’ve found that 72- and 87cc chambers are those that most hobbyists are familiar with.”

Edelbrock quickly dispels any notion that the original Performer RPM cylinder head, with its scalloped chamber will be discontinued. “It remains a very good seller for us, and we expect good sales in the future,” Smith says. “Our customers have been using it for more than 20 years and are very familiar with its features and capabilities. Performer RPM castings are available with valvesprings compatible with hydraulic flat-tappet or hydraulic roller camshafts up to 0.575-inch lift. The 72cc castings retail for approximately \$1,300, while the 87cc castings sell for about \$1,200. And because the 87cc castings are equipped with an exhaust crossover, they are CARB approved.”

When asked how Edelbrock plans to market the CNC-variants of its Pontiac V8 cylinder heads, Smith replies, “There are plenty of hobbyists using our original Performer RPM casting, and they’re satisfied with the quality and performance. While some existing users may upgrade to the new Performer RPM CNC casting for its performance advantages, we really hope to bring in new customers like the Performer D-port did for us, particularly those who are newcomers to the





We took the opportunity to flow the new Performer RPM CNC on our Superflow SF-110 flow bench. All measurements were taken between 10 and 15 inches pressure and mathematically converted to 28 inches. Our testing reveals that the 87cc casting contains a peak intake flow capacity of 277 cfm and 197 cfm exhaust.

Pontiac hobby and looking for the most modern casting available. We really look for it to help grow the sales of the entire Pontiac engine family."

Should you find that professional Pontiac engine builders have limited experience with Edelbrock's new Pontiac V8 cylinder head, we can report there's a valid reason. Much of a professional builder's business is tailoring an engine package for his/her customers' needs, and that often includes specific cylinder head preparation. Since Edelbrock's Performer RPM CNC line boasts fully assembled cylinder heads that are ready-to-run, and it doesn't yet offer a semi-machined (or bare) casting for Pontiac V8, it means builders must start with a fully assembled product and may not be able to reuse some of the existing accessories Edelbrock provides, making it a cost-prohibitive venture for the budget-minded consumer. Edelbrock has recognized this and is actively considering offering its Performer RPM CNC for Pontiac V8 in a semi-machined state and welcomes your comments if it interests you.

When a product is as successful as the Performer RPM cylinder head, altering its current form certainly seems risky, but Edelbrock found from its past experience with other makes in which a heart-shaped chamber was added, new sales resulted. The company fully expects the Pontiac hobby to follow suit, and for those who want the latest technology for their old Indian, the Performer RPM CNC delivers modernity. **END**

#### PERFORMER RPM CNC

61515	72 cc with hydraulic roller valvesprings
61525	87 cc with hydraulic roller valvesprings
61519	72 cc with hydraulic flat-tappet valvesprings
61529	87 cc with hydraulic flat-tappet valvesprings



The 87cc versions of Edelbrock's Performer RPM or Performer RPM CNC contain an exhaust crossover, which makes them a smog-legal replacement in all 50 states.

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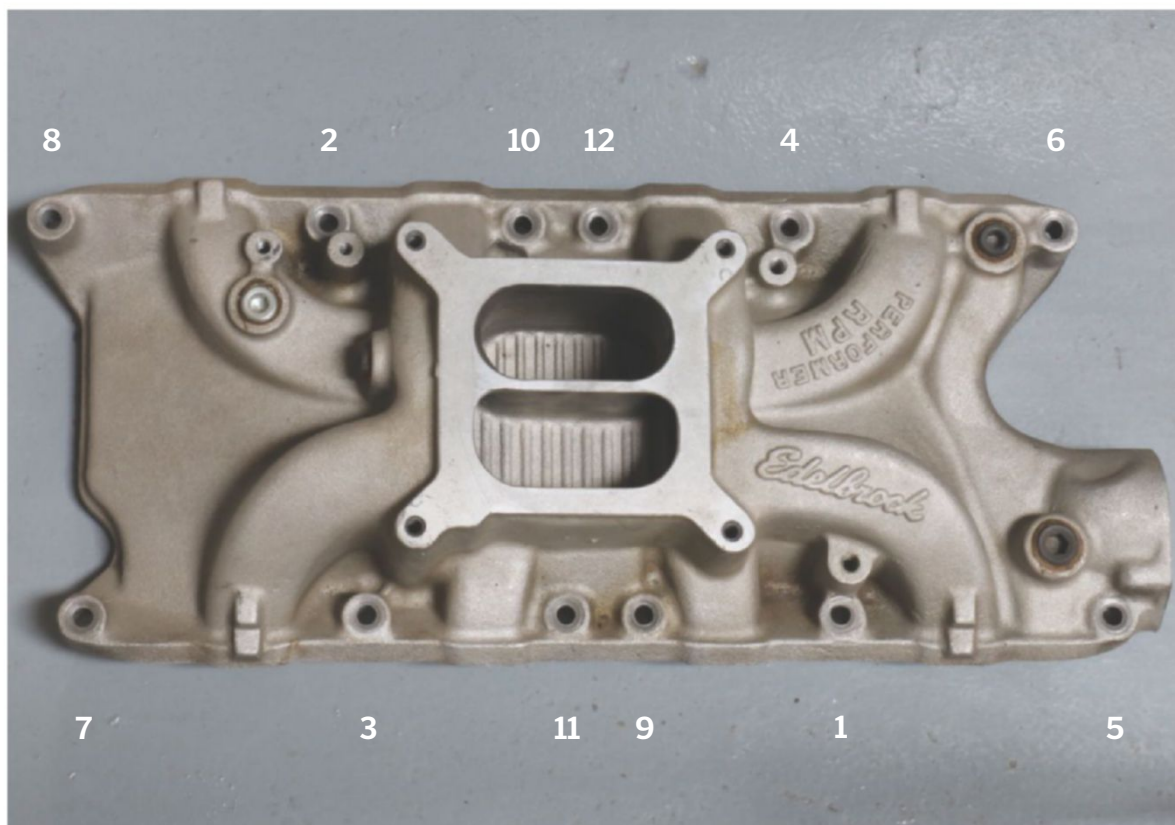
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0.600	277/197 cfm

#### →SOURCE

Edelbrock; 800/416-8628; Edelbrock.com



# ASK ANYTHING



This manifold bolt-tightening procedure is slightly different from the standard center-out process and may improve manifold sealing. Note that the final torque is applied to the center bolts.

## GASKET TECH

**Bob Dorr; Holden, ME:** Thanks for the great column. I always look forward to checking it out and learning something new. I'd like to make a comment on the question from Jol Hennessey in the Nov. 2014 issue. I have a similar small-block Ford with Edelbrock heads, Performer RPM intake, Holley carb, and MSD ignition. For years, I chased poor driveability issues with stumbling, very rich, eye-burning exhaust, unstable idle, and overall poor performance. Symptoms always pointed to a vacuum leak, but I could never find anything on the exterior of the engine.

While swapping to the Air Gap intake, I noticed that the lower part of the gasket for the intake ports (nearest the lifter valley) were very wet. After installation, the car ran a lot better, but slipped back to running poorly fairly rapidly. Pulling the intake again found more wet gaskets. At that point, I was using stock gaskets with no sealer. I

tried several types of performance gaskets: Ford Motorsport, Mr. Gasket Ultra-seal, Edelbrock, and Fel-Pro Performance. None would hold up for any period of time. They would typically not hold the torque (only 22 lb-ft!) for very long and would end up getting crushed and start leaking again after re-torquing.

After much frustration, I decided to go back to the steel core stock gaskets and add a skim of fuel-resistant silicone sealer around each intake port. This has taken care of the problem and makes the car much more fun to drive. I'm not sure why I had such trouble getting the intake to stay sealed. Possibly it has something to do with the extra thickness of the composition head gaskets throwing off the intake-to-head angle, or maybe I'm just not very good at installing an intake manifold! Either way, it seems to have done the trick and thought it may help others who have similar problems. Thanks for your time and keep up the good work!

**Jeff Smith:** Thanks, Bob, for your input. It's always great to hear from our readers who often have great insight into the everyday issues of performance cars. Intake-sealing issues like this are relatively common and not only related to the small-block Ford. We've experienced internal intake-manifold vacuum leaks in the past with several small-block Chevys. Our issue was related to oil usage where the engine would consume oil—leading us to think the valvetrain seals were bad when the oil was actually coming from a poor seal at the base of several intake ports.

The small-block Ford presents a unique issue with sealing the intake manifold to the heads, partly due to the angle of the intake-manifold bolts. While most manufacturers angle the manifold-attaching holes in the head 90 degrees to the sealing surface, Ford chose to angle the attaching bolts at a more vertical angle. This may have been in an attempt to create a wedge





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## ASK ANYTHING

effect between the intake and the head-sealing surfaces, but it also limits the effective clamping load. This is made even more tenuous with the use of  $\frac{5}{16}$ -inch intake bolts instead of the more common  $\frac{3}{8}$ -inch bolts.

There is no easy way to check the angle of the interface between the manifold and the heads unless you go to lengths of comparing angles taken with a digital angle finder. There are some ideas that can and do help. Bob mentioned using stock gaskets with a steel core. Fel-Pro makes intake gaskets now with an "S" suffix that indicates the gasket has a steel core. For stock or near-stock small-block Ford 289-302 Windsor heads, this Fel-Pro gasket would be PN 1250-S3. We spoke with Fel-Pro's Greg Smith, who said Fel-Pro does not recommend using RTV around the intake ports because users often employ too much, which acts like a lubricant, allowing the gasket to move. He recommends no more than the thinnest skim coat of RTV if you choose to use it.

Greg mentioned that one of the most common causes for this kind of leak occurs because the intake manifold and head surfaces are not parallel. The recommendation is that the sealing surface of the intake port be 0.003 inch tighter at the bottom between the intake and cylinder head than the top of the intake port. One way to measure this is to sacrifice an intake gasket by drilling four  $\frac{3}{16}$ -inch holes in the gasket's upper and lower areas surrounding the intake port. Then insert lead shot (0.125-inch thickness) in the holes (held in place with white grease). Next, torque the intake down and then remove and measure the lead shot's compressed thicknesses in each location. If the upper lead shot is thinner than the lower, the intake manifold is not parallel to the head. Fel-Pro's recommendation is to machine the intake to produce the required 0.003 inch tighter clearance at the bottom.

Another suggestion would be to use an ARP intake manifold stud kit (PN 354-2103, \$60.72, Summit Racing) to not only help drop the intake on properly but also assist in a better clamp load on the gasket. Studs also reduce the wear and tear on the threads in the head, especially if the heads are aluminum. We've also included a slightly altered bolt-tight-

ening schedule for the Ford. West says he does not think changing the tightening sequence will affect the seal, but we included it since it can't hurt. Employing any of these ideas can only help seal up those pesky intake leaks, which will allow your engine to run much better.

## MORE INFO

**Federal-Mogul (Fel-Pro);**

248/354-7700; Federal-Mogul.com

## FINE LINES

**Glenn Hiller; Higganum, CT:** My 1969 Chevelle is getting old and has the original hard fuel lines from the tank forward. I plan on removing the gas tank and changing the sending unit, maybe even the tank also. Since this is a job I only want to do once, what type of fuel line would you recommend I put in there? I'd like something that will last longer than a few years, with ethanol-based fuel. I believe they are slip-on lines. One is  $\frac{3}{8}$  inch and the other is  $\frac{5}{16}$  inch.

**Jeff Smith:** It's not unusual for cars approaching 50 years old to run into corrosion problems, even on something as simple as the fuel line. It's doubtful that the Chevrolet engineers considered how well these standard steel fuel lines would hold up some five decades later. Thankfully, Chevilles and Camaros are so popular that there are several avenues from which to select a fuel line. If you are a traditionalist, then a standard replacement line is what you seek. Since you are concerned about corrosion, I'd suggest going with a stainless steel fuel line. This would be a true test of your bending skills to do correctly, but you don't have to. Classic Tube makes a direct replacement fuel line that will be bent in all the right places. The difficulty will be in fitting it over the rear crossmember since the line runs between the body and the rear crossmember. I don't think it's possible to snake the line up between the crossmember and the body, and I doubt that you are interested in yanking the body. But there is another option.

A possible option is to loosen all the body mounts on both sides. If the body has never been removed, this might require several soakings over several days with a quality penetrant/lubricant like WD-40. Remove all the bolts on the passenger side and use a



pair of jacks to carefully raise the body off the frame. You will have to judge whether there's enough room to slide the fuel line in place. If so, then you can repeat the process with the vent line. It appears on some Chev-elles and El Caminos that it runs down the passenger side of the frame. A shortcut involves cutting the fuel line and flaring the ends and installing tube nuts on both ends. I would cut the line on the front side of the rear crossmember, keeping the aft portion as short as possible. Then use a female-to-female adapter fitting to attach the two lines at a point where you can access it easily and still snake the line over the crossmember. This may require bending the line and re-bending it after it makes it thorough the frame. This isn't as good of an idea since it creates a pair of potential leak paths that would not be there with a one-piece fuel line.

I would avoid using a flexible braided stainless AN fuel line. While this is definitely easier to snake thorough the rear cross-member area, all the new additives in fuel have conspired to take their toll on the rubber in the line. I've had rubber AN fuel line become brittle, crack, and leak in as little as six months. On the other side, I think there are some quality rubber lines that will last for several years. It's difficult to judge how long these braided rubber fuel lines will survive. It sounds like you are more interested in long-term solutions—and there is yet another. It's just not cheap.

Beside hard line and rubber AN line, there is another material that is used by the OEs in all current cars for at least 10 years. It's called PTFE, which is a long-winded chemical name for a certain kind of plastic. We can't call it Teflon because that's a registered brand name owned by DuPont. A number of hose companies like Aeroquip, Brown & Miller, Earl's Goodridge, and TechAFX make PTFE hose. The hose should last the life of the vehicle and is impervious to all types of fuel, including ethanol,

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methanol, and even nitromethane! Of course, this stuff isn't cheap and the fittings are also specific to the hose, so you won't be able to use any of your existing AN fittings. It is also easy to kink, so a wider bend radius is required; for your application, you should not have a problem. The hose is stiffer than typical rubber AN hose, but with its extreme life expectancy, you can install it and forget about it.

We've installed TechAFX's version of this fuel line in my 1965 El Camino just so I don't have to worry about it ever again because, like you, I had a problem with rusted fuel lines and wanted to install an EFI system on the car. We decided that the added hassle of using this PTFE-style hose was a worthy long-term solution. If you want to know more, the guys at TechAFX have produced a YouTube video on how to cut and install fittings on the hose. I've performed the hose end installation and it's a little more of a hassle because the fitting uses a ferrule, but it certainly is not difficult. It's interesting how the least-expensive version is the most difficult to execute, while the most expensive is probably the least difficult. I guess that's how life is.

## MORE INFO

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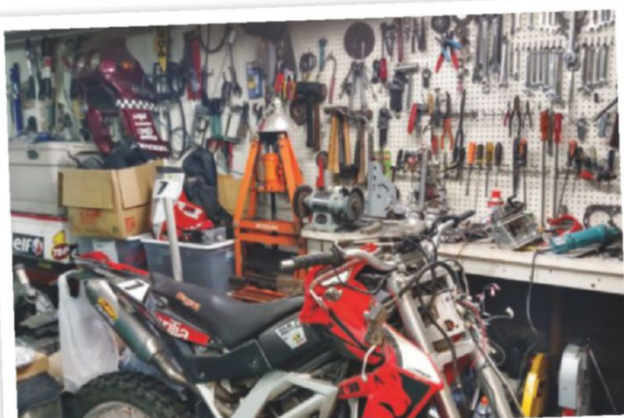
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Rare muscle-car sighting! We spotted this Yenko Deuce the last time we stopped by Mas-car Modern and Classic Auto-body to check in on our 1972 Chevelle. That's owner Kenny Maisano in the process of removing the transmission on this 1970 Nova, one of 175 built by Yenko Chevrolet.



# THIS GUY'S GARAGE



The motorcycle fairing on the wall is one he removed from his Cagiva Elefant (powered by a Ducati engine). He replaced it with a custom, carbon-fiber unit he made to accommodate an extra radiator. The Aprilia dirt bike is currently undergoing some fairing repairs due to a recent crash during a rally in Mexico. He plans to redesign the front fairing to increase its strength and reposition the navigation tools.

The Suzuki TD-400 was bought for \$400. It is a torquey 2-stroke from the early 1970s and runs like a champ.



## JOHN DEYKES / Mission Viejo, CA

John Deykes does work on the family cars, but his passion is building and racing off-road, endurance motorcycles. Growing up watching the Dakar Rally, he made it his dream to do the grueling international event at least once in his life. He poured his heart, soul, and wallet into preparation, and with the help of his friends and family, he made it to the starting line in 2008. However, due to political unrest and threats of

terrorism against the racers, the race was canceled. Though he was crushed, he didn't let this get him down. He raced both the Baja 500 and 1000 twice and still races in the Baja Rally (a motorcycle-only event) to this day. When his daughters were old enough to drive, John gave them the option of getting a typical high school commuter car, but the eldest, Naya, chose a 1968 Mustang with an original 289 small-block





The front bumper of daughter Tiana's 1952 F-1 is getting rechromed. When they purchased the truck, it was coated with rattle-can black. They replaced the fenders with reproduction, fiberglass parts due to excessive body filler in the original panels.

and her younger sister, Tiana, choose a 1952 Ford F-1 with a 351 Windsor swap. Both vehicles were gifted to them in project state for their 16th birthdays, and after a year of father-daughter restoration, the girls got them back for their 17th birthdays. John made sure to include his daughters in the process, teaching them to turn a wrench and give them the confidence to fix things themselves. The girls definitely enjoyed

the confidence boost in the form of classics cars, which helped shape their identity in high school. Naya is very involved in the classic-car community, co-founding a classic car club with her boyfriend. Tiana is counting the days until she can cruise with the club.

**By Zach Martin / Photos: Zach Martin**



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99210865

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ITEM 90899  
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## 2500 LB. ELECTRIC WINCH WITH WIRELESS REMOTE CONTROL

Item 61840 shown

LOT NO. 68146  
61258/61297/61840

## \$49.99

REG. PRICE \$149.99

**SAVE \$100**

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## CENTRALPNEUMATIC® 20 OZ. GRAVITY FEED SPRAY GUN

LOT NO.  
47016/67181/62300

## \$9.99

REG. PRICE \$29.99

**SAVE 66%**

Item 47016 shown

99200406

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### SUPER COUPON

## SAVE \$50

## RAPID PUMP® 2 TON ALUMINUM RACING JACK

Item 68051 shown

LOT NO.  
68051/61406  
62247/62457

## \$129.99

REG. PRICE \$179.99

**3-1/2 Pumps Lifts Most Vehicles**

**Weights 43 lbs.**

PITTSBURGH

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### SUPER COUPON

## PITTSBURGH 2 TON FOLDABLE SHOP CRANE

LOT NO. 69514/60388  
Item 69514 shown

## \$179.99

REG. PRICE \$229.99

**SAVE \$120**

• Includes Ram, Hook and Chain

99204202

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### SUPER COUPON

## WELDING MIG-FLUX WELDING CART

Welder and accessories sold separately

LOT NO. 69340/60790  
90305/61316

## \$35.99

REG. PRICE \$59.99

**SAVE 40%**

Item 69340 shown

99210785

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### SUPER COUPON

## 1/2" INDUSTRIAL QUALITY SUPER HIGH TORQUE IMPACT WRENCH

LOT NO. 68424

## \$74.99

REG. PRICE \$99.99

**SAVE \$55**

• 700 ft. lbs. Max. Torque

99202495

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### SUPER COUPON

## 900 PEAK/ 700 RUNNING WATTS 2 HP (63 CC) 2 CYCLE GAS RECREATIONAL GENERATOR

LOT NO. 66619/60338/69381/62472

## \$99.99

REG. PRICE \$179.99

**SAVE \$80**

Item 69381 shown

99202813

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### SUPER COUPON

## 44", 13 DRAWER INDUSTRIAL QUALITY ROLLER CABINET

US • GENERAL

LOT NO. 68784  
69387/62270

## \$359.99

REG. PRICE \$699.99

**SAVE \$340**

• Weights 245 lbs.

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99201076

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### SUPER COUPON

## MICROFIBER CLEANING CLOTHS PACK OF 4

LOT NO. 69678/68440

## \$1.99

REG. PRICE \$3.99

**SAVE 50%**

Item 69678 shown

99201424

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### SUPER COUPON

## PITTSBURGH 2000 LB. CAPACITY FOLDABLE ENGINE STAND

LOT NO. 69522/69521/67015

## \$109.99

REG. PRICE \$149.99

**SAVE \$40**

Item 69522 shown

99204516

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### SUPER COUPON

## PITTSBURGH 3 TON HEAVY DUTY STEEL JACK STANDS

LOT NO. 38846  
69597/61196/62392

## \$19.99

REG. PRICE \$44.99

**SAVE 55%**

Item 38846 shown

99207252

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### SUPER COUPON

## 2.5 HP, 21 GALLON 125 PSI VERTICAL AIR COMPRESSOR

CENTRALPNEUMATIC®

Item 67847 shown

LOT NO. 67847  
61454/61693

## \$149.99

REG. PRICE \$219.99

**SAVE \$70**

99207805

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**SUPER COUPON!**

**12 TON SHOP PRESS**  
CENTRAL MACHINERY

• Pair of Arbor Plates Included

LOT NO. 33497  
60604

Item 60604 shown

**SAVE \$100**

**\$99<sup>99</sup>**

REG. PRICE \$199.99

99221558

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**SUPER COUPON!**

**TORQUE WRENCHES**  
PITTSBURGH

• Accuracy within ±4%

**YOUR CHOICE!**

**\$299**

**\$219<sup>99</sup>**

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**SUPER COUPON!**

**170 AMP MIG/FLUX WIRE WELDER**

**SAVE \$135**

**\$164<sup>99</sup>**

REG. PRICE \$299.99

LOT NO. 68885  
61888

Item 68885 shown

99229838

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**SUPER COUPON!**

**4-1/2" ANGLE GRINDER**  
drillmaster

LOT NO. 95578  
69645/60625

Item 60625 shown

**SAVE 50%**

**\$99<sup>99</sup>**

REG. PRICE \$19.99

99226179

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**SUPER COUPON!**

**1000 LB. CAPACITY MOTORCYCLE LIFT**  
PITTSBURGH

• Height Range: 7" - 30"

**SAVE \$380**

**\$319<sup>99</sup>**

REG. PRICE \$699.99

99215612

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**SUPER COUPON!**

**30" SERVICE CART WITH LOCKING DRAWER**  
• 350 lb. Capacity

LOT NO. 90428/61161

Item 90428 shown

**SAVE \$95**

**\$54<sup>99</sup>**

REG. PRICE \$149.99

99219104

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**SUPER COUPON!**

**MECHANIC'S GLOVES**

**MEDIUM** LOT NO. 61235  
62434/62426

**LARGE** LOT NO. 93640/60447  
62433/62428

**X-LARGE** LOT NO. 93641/60448  
62432/62429

Item 93640 shown

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**\$399**

REG. PRICE \$9.99

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**SUPER COUPON!**

**RETRACTABLE AIR HOSE REEL WITH 3/8" x 50 FT. HOSE**  
CENTRAL PNEUMATIC

LOT NO. 93897  
69265/62344

Item 93897 shown

**SAVE \$90**

**\$59<sup>99</sup>**

REG. PRICE \$149.99

99226219

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**SUPER COUPON!**

**2 PIECE VEHICLE WHEEL DOLLIES**  
HaulMaster

LOT NO. 67338  
60343

Item 67338 shown

**SAVE 37%**

**\$49<sup>99</sup>**

REG. PRICE \$79.99

99219131

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**SUPER COUPON!**

**40 LB. CAPACITY FLOOR BLAST CABINET**  
CENTRAL PNEUMATIC

Item 68893 shown

LOT NO. 68893/62144

**SAVE \$110**

**\$189<sup>99</sup>**

REG. PRICE \$299.99

99227401

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**SUPER COUPON!**

**36" METAL BRAKE WITH STAND**  
CENTRAL MACHINERY

LOT NO. 91012/62335/62518  
Item 91012 shown

**SAVE \$90**

**\$189<sup>99</sup>**

REG. PRICE \$279.99

99230025

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**SUPER COUPON!**

**10 FT. x 20 FT. PORTABLE CAR CANOPY**  
HIT

LOT NO. 69034  
60728

Item 69034 shown

**SAVE \$100**

**\$99<sup>99</sup>**

REG. PRICE \$199.99

99213359

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**SUPER COUPON!**

**MULTI-USE TRANSFER PUMP**  
PITTSBURGH

LOT NO. 66418/61364

Item 66418 shown

**SAVE 66%**

**\$49<sup>99</sup>**

REG. PRICE \$14.99

99220392

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**SUPER COUPON!**

**12 VOLT, 10/2/50 AMP BATTERY CHARGER/ENGINE STARTER**  
CENTECH

LOT NO. 66783/60581/60853/62334

Item 60653 shown

**SAVE 62%**

**\$299**

REG. PRICE \$799.99

99223578

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**SUPER COUPON!**

**MOVER'S DOLLY**  
HaulMaster

• 1000 lb. Capacity

LOT NO. 93888/60497  
61899/62399

Item 93888 shown

**SAVE 40%**

**\$89<sup>99</sup>**

REG. PRICE \$14.99

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**SUPER COUPON!**

**STEP STOOL/WORKING PLATFORM**  
HaulMaster

LOT NO. 66911/62515

• 350 lb. Capacity

**SAVE 28%**

**\$24<sup>99</sup>**

REG. PRICE \$34.99

99218844

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**SUPER COUPON!**

**6" SELF-VACUUMING AIR PALM SANDER**  
CENTRAL PNEUMATIC

LOT NO. 60628/98895

Item 98895 shown

**SAVE 66%**

**\$19<sup>99</sup>**

REG. PRICE \$59.99

99211522

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**SUPER COUPON!**

**2" x 20 FT. TOW STRAP**  
HaulMaster

• 2800 lb. Working Load

LOT NO. 36612/60675/61943

Item 36612 shown

**SAVE 50%**

**\$99<sup>99</sup>**

REG. PRICE \$19.99

99214173

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# LOW-DOLLAR DART

## Part 1: Buying an A-Body Mopar on a Budget

By Jason Sands / Photos: Jason Sands

➔ Unless you've been living under a rock, you're probably aware of the fact that you can take an LS engine, stick a turbo on it, and run 11s or even 10s in any old pile of junk. While this is the current trend, we have to ask: What's wrong with cubes, compression, and big cams? How about deep gears? Big stall converters and nitrous plates? You guys better get ready for an old-school performance build, because one is coming!

Having recently spotted a 1971 Dart on Craigslist for \$2,900, we decided it would be a great idea to purchase this mildly modified Mopar, with the intent

of building a budget hot rod out of it. While \$2,900 sounds like a bunch of money for a lowly Dart, we considered what it had going for it. The car had a 360 engine out of a 1974 Challenger, a rebuilt 727 transmission with a 2,300-rpm stall converter, and the strong 8¾ rearend in it.

The more we thought about the Dodge, the more we realized this project is right where many people buy their own vehicles to modify. It had all the bolt-ons: an aftermarket intake, Holley 750 carb, headers, muffler shop dual exhaust, and a performance ignition system, which made for a solid foundation.

Still, there was a problem: the Dart was in Oceanside, California—a good 500 miles away from the project's home base. After two solid months of looking and searching, we weren't about to let this one slip by, so we rented a car and drove down, determined to drive the rusty Dart eight hours back to northern California.

When we finally arrived, we found a car that was a bit rougher than expected. There was rust in the rear quarter (which we knew about), but there were also lots of shopping-cart-style dings down both sides of the car, along with a lot of bondo around the top near the rear window area. Oh well,







The previous owner had installed this mid-1970s 360 engine in the Dart. While we didn't expect much out of the low-compression engine, we thought it would still pump out around 200 hp, assuming it is in good shape.



An aftermarket intake and carburetor are often some of the first performance modifications that hot-rodders perform to their rides. The Dart already had an Edelbrock intake, along with an overkill 750 Holley Double Pumper, which should be good to 500 hp or more.

The stock ignition system had been turned electronic years ago and had the added benefit of a Summit Racing rev-limiter, but with 2.76 gears, it was pretty hard to miss a shift.



Performance exhaust systems vary greatly in size, sound, and flow capacity. The one that was installed on the '71 was a bit small. It's something that definitely will be upgraded in the near future.





Not only did we have a performance 727 transmission, we had the rebuild receipt from the upgrade a few years ago. With a 2,300-rpm stall converter and TransGo Stage 2 shift kit, we expect the slushbox to last through multiple power upgrades, and we'll also keep the B&M ratchet shifter.



Above: One of the big pluses for this car was that it already had an 8 $\frac{3}{4}$  rear end under it. Used ones cost about \$600 to \$800, if you can even find one in your area. Ours was an open-differential 2.76-geared unit, but we're planning for 3.55 gears and a limited slip in the future. As an alternative, an 8 $\frac{3}{4}$  rear out of a B-body will work with offset wheels and the springs at a slight angle (the perches are slightly different), but if you want to do that install "right," you can cut the housing, buy new axles, and relocate the perches, which will run about \$700 (plus the cost of the rearend).



One of the drawbacks of the early Darts is that they have 5x4-inch, small-bolt-pattern wheels. While there are still some companies that make aftermarket wheels for this pattern, selection is limited.



The rear quarter-panel was a mixture of Bondo, rust, and primer—probably the roughest spot on the car. We'll be looking to replace the whole section soon; at this point, it's too far gone to Band-Aid.

nothing a vinyl top won't fix. Besides, track times are the goal. On the plus side, when we drove it, the transmission shifted like it was supposed to, the engine didn't smoke, and it felt like a solid little starter car overall.

Before we start on the go-fast stuff, we needed to get a good baseline on

the car. We also wanted to weigh it, as making the Dart as light as possible will be very important in quick drag-strip times, which is why we chose an A-body instead of a heavier B- or C-body. Although the numbers aren't impressive yet, they're going to be—everyone has to start somewhere!

Our interior left much to be desired, but at least it had carpet, a headliner, and door panels. The seats looked like they'd been ripped up by Wolverines. They will soon be replaced with some racing buckets.







Another poor fix was the Bondo and primer on the top of the Dodge, which looks like it had been done without even removing the chrome trim. This is another area we plan to fix or clean up a bit and vinyl top-over.



The dry-rotted tires were our biggest concern in making it back from Oceanside, California, and the spare was even worse. Surprisingly, it actually held air despite the steel belts showing, and the weather-worn radials actually made the whole trip without going flat.

## BUT I DON'T HAVE A 360 ENGINE, 727 TRANSMISSION, OR 8<sup>3</sup>/<sub>4</sub> REAR END

We hit the drivetrain jackpot with this one, but don't worry if you don't have all of these things. While many folks think the best use for a 318 is a boat anchor, they're not bad engines. Virtually everything you can do to a 360 you can also do to a 318—it'll just be down about 30 to 60 hp compared to the bigger small-block. **Car Craft** did a 400hp 318 build way back in 2004 with mostly stock parts (check CarCraft.com), so the little engines really can make some power.

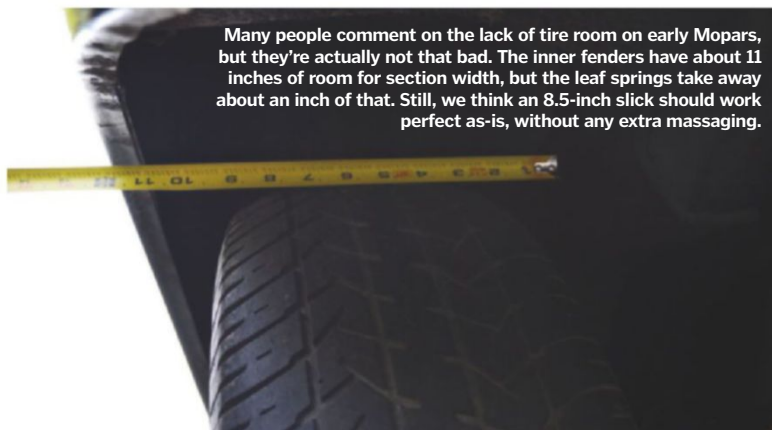
The same goes with 904 transmissions. With a good stock rebuild and shift kit, 904s are awesome for moderate power levels and can be built to handle some serious power with aftermarket parts. While the 727 is, in our

opinion, a better overall transmission, the 904s actually have less rotating weight, which means more power to the wheels.

Unfortunately, if you have the wimpy 7<sup>1</sup>/<sub>4</sub> slant six rear-end, you're out of luck because it will probably break on the first burnout. The 8<sup>1</sup>/<sub>4</sub> (which came on later-model A-bodies) is better, but the 8<sup>3</sup>/<sub>4</sub> is really the way to go for performance applications. Its drop-out centersection makes it easy to change gears, and there are plenty of options available. If you're planning on 5,000-rpm trans-brake launches, there's always the option of building a Dana 60, too, although we're going to stick with the 8<sup>3</sup>/<sub>4</sub> for as long as it holds up.



We received some of the best news when we hit the scales. With a spare tire, jack, and a bunch of rescue tools in the car, it tipped the scales at 3,200 pounds, which means it wouldn't take much power to make the Dart go fast.



Many people comment on the lack of tire room on early Mopars, but they're actually not that bad. The inner fenders have about 11 inches of room for section width, but the leaf springs take away about an inch of that. Still, we think an 8.5-inch slick should work perfect as-is, without any extra massaging.



Our nearby dragstrip was closed, so we had to make due with the time off of our data logger: a G Tech Pro SS. It's tested within one- to two-tenths of a second compared to the track on prior occasions. Here, it gave us a best pass of 15.08 at 94.2 mph. The 60-foot time on street tires and with tall gears was a snooze-inducing 2.54 seconds, while the 0-60-mph time came in 6.72 seconds. Based on the trap speed and weight, that's about 192 hp at the wheels, which sounds about right.



Now that you've been brought up to speed on the Low-Dollar Dart, you're probably wondering what we're going to do with it. Our plan is to finish where the previous owner left off, doing the next logical modifications of a lumpy performance camshaft, gears, and tires. After that, we're going to modernize the exhaust and put a little nitrous on it. The build will be focusing on dragstrip times and traction, and our goal is to prove that you don't need 500 hp to run 12s or even 11s. Stay tuned for some fun. **END**



## WHAT WE LEARNED IN 500 MILES

- The 2.76:1 gears might not do a lot for performance, but they sure are nice for cruising. At a road speed of 70 mph, the Dart is loafing along at about 2,500 rpm.

- The engine doesn't pull past 4,500 rpm at all, so we're thinking the cam is stock. Either that, or something is wrong, which is also a possibility.

- Gas mileage is better than expected, considering the 70–75-mph road speeds. The best tank so far is 16.3 mpg and the worst is 14.8 mpg—both factor in that the speedo is off by about 10 percent. At 55–60 mph, it should knock down 18 mpg or more.

- The fuel gauge just quit. Oh well, time to start filling up every 150 miles or so.



- The voltage gauge is permanently stuck on “discharge” once the headlights were turned on. That would explain why there was a sticky note over it when we bought the car. Hope it doesn't quit. (It hasn't so far.)



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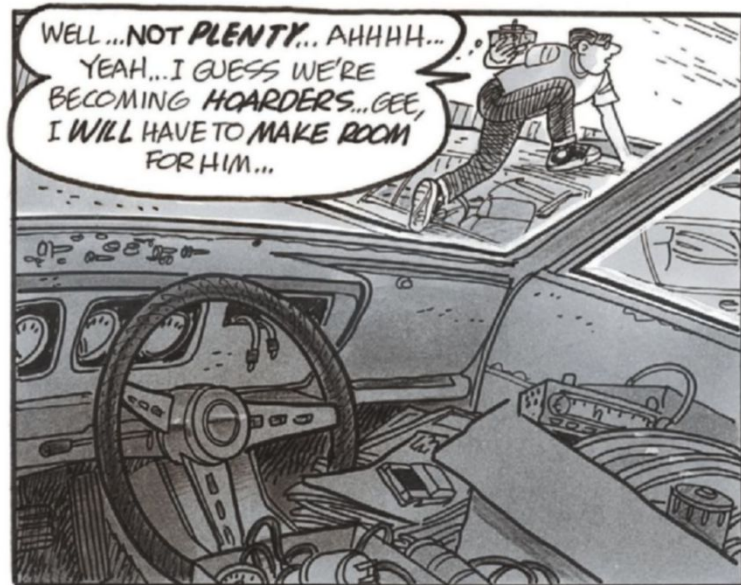
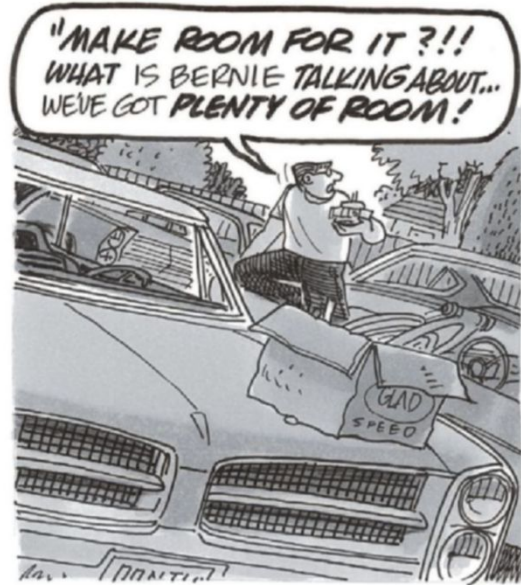
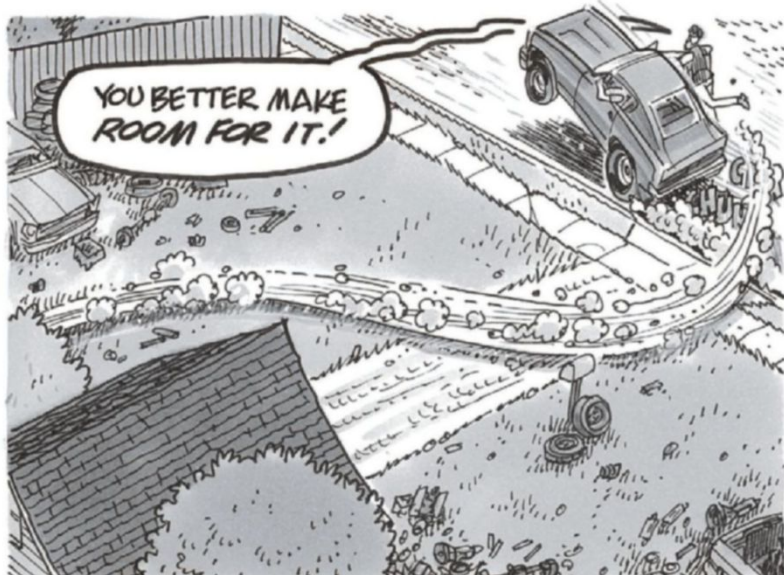
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BUT IT'S ALL GOOD STUFF! LIKE THIS '67 CAMARO... DIDN'T I JUST SEE THE 302 FOR THIS BACK THERE SOMEWHERE?

YEP! AND ALL THE GOODIES WERE IN THE TRUNK. NOW IT SOUNDS LIKE SOMETHING!

DIDN'T I SEE THE GRILL AND FENDERS ALONG THE SIDE OF THE GARAGE... HOOD TOO!



YEAHHHHH... NOW IT LOOKS LIKE SOMETHING!

FORTUNATELY... I HAPPEN TO KNOW WHERE THE INTERIOR IS!

AS WELL AS THE END TABLE ORIGINAL WHEELS!



AND LOOK... A REALLY COOL ALL ORIGINAL '67 CAMARO! I WONDER WHAT IT WOULD BRING AT THAT AUCTION...

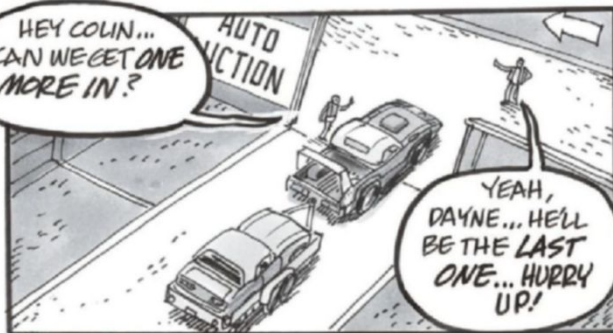
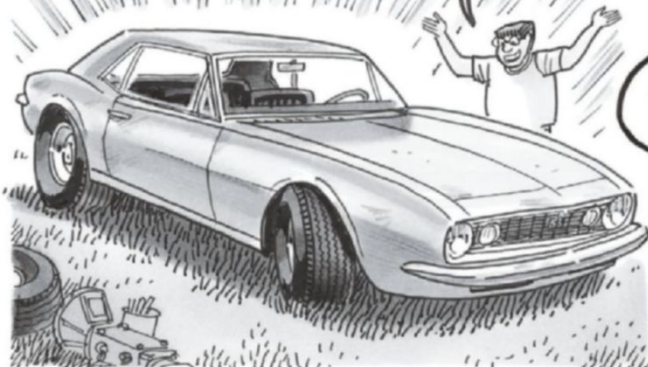
ONLY ONE WAY TO FIND OUT...



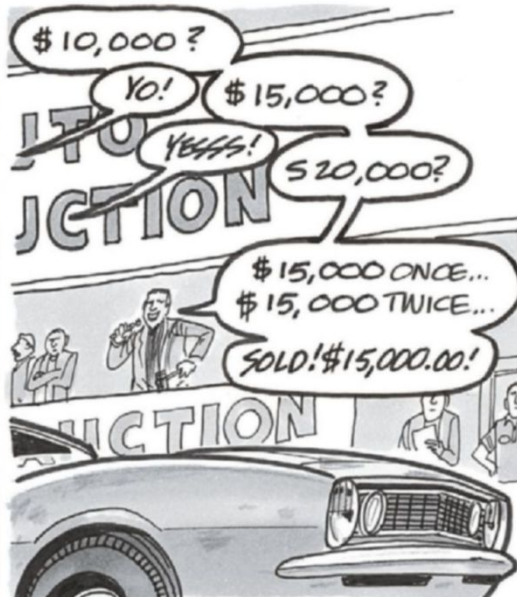
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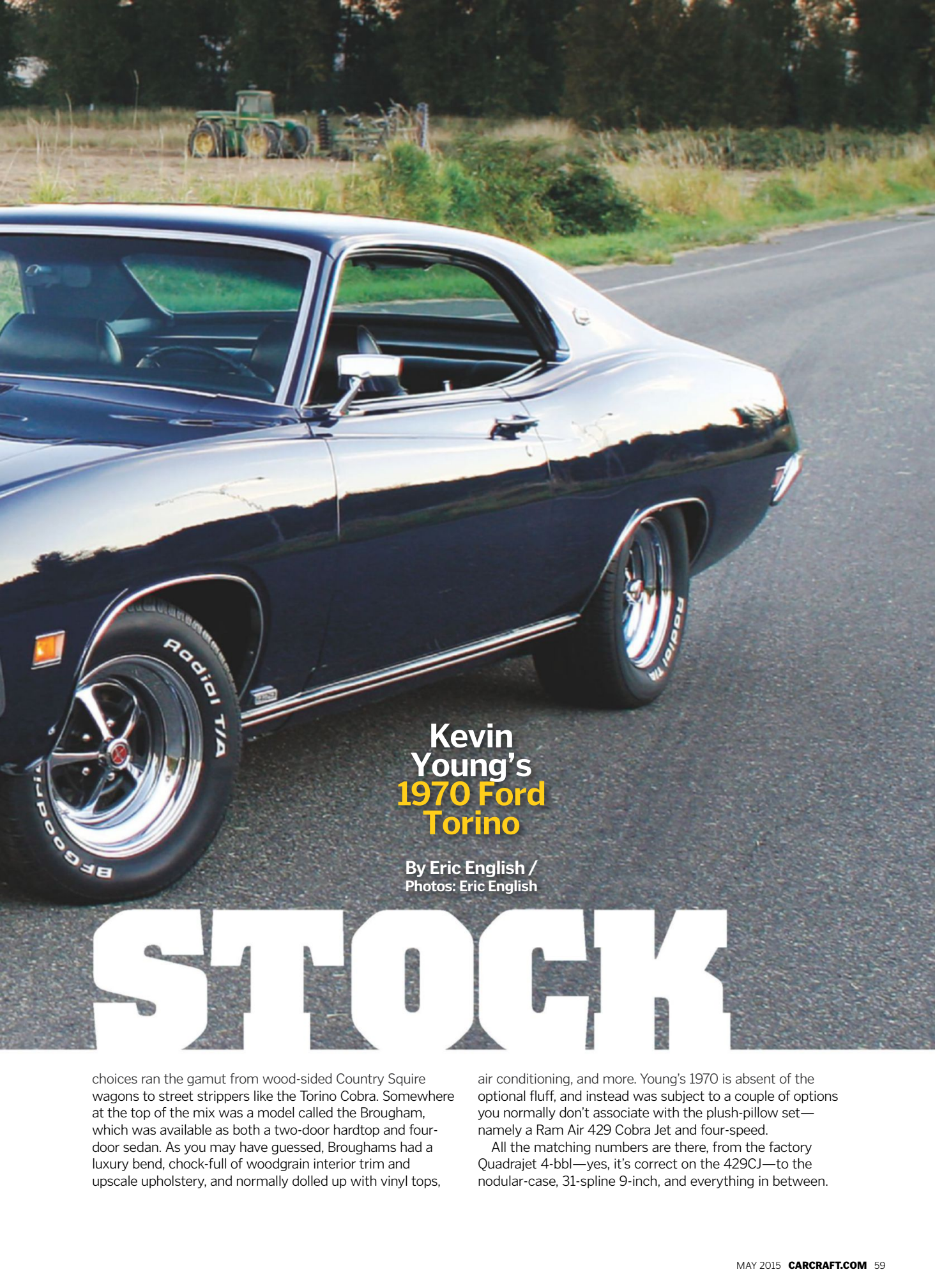
# ALMOST

**W**hen it comes to his 1970 Torino, Kevin Young says he's been accused of both sacrilege and not going far enough. Number-crunchers love to go over classic muscle cars with a fine-tooth comb, comparing part numbers, casting dates, build dates, and more in an effort to determine how original or factory-perfect said car may be. On the other hand, hot rodders have historically viewed factory

muscle as a starting point to building something even faster and generally couldn't care less about matching numbers or factory-correctness. Thankfully, Kevin ignored the naysayers and did the car his way—which is to say, very cool.

Back when Young's car was built, you could say the Torino tried to be everything to everybody. Powertrains ranged from six-cylinders to 429 Super Cobra Jets, and model





Kevin  
Young's  
**1970 Ford  
Torino**

By Eric English /  
Photos: Eric English

# STOCK

choices ran the gamut from wood-sided Country Squire wagons to street strippers like the Torino Cobra. Somewhere at the top of the mix was a model called the Brougham, which was available as both a two-door hardtop and four-door sedan. As you may have guessed, Broughams had a luxury bend, chock-full of woodgrain interior trim and upscale upholstery, and normally dolled up with vinyl tops,

air conditioning, and more. Young's 1970 is absent of the optional fluff, and instead was subject to a couple of options you normally don't associate with the plush-pillow set—namely a Ram Air 429 Cobra Jet and four-speed.

All the matching numbers are there, from the factory Quadrajet 4-bbl—yes, it's correct on the 429CJ—to the nodular-case, 31-spline 9-inch, and everything in between.



And here's where the number-crunchers get all excited: While you might imagine that few upscale buyers were interested in a big-block and four-speed, you'll likely be surprised that Young's car is just one of three Broughams built this way. In other words, single-digit rare.

When Young bought the car in 2008, it had been nicely dressed out for show; the underhood view was neat as a pin, the factory shaker and Hurst shifter hinted at great things beneath, and Magnum 500 wheels made the stripeless and decal-lacking sheetmetal really pop. Young enjoyed the car for a while as is, and found the front bench seat was perfect for cruise nights with his wife and four growing kids.

Fast-forward five years to 2013, and Young noticed some unusual valvetrain noise. While it turns out a set of lifters would've cured the problem, in the best hot rodder tradition, Young saw it as an opportunity to tear down the motor and build something better. The goal was a reliable, street-friendly, pump-gas engine that was capable of easy 12s on street tires, all the while retaining a factory restored appearance—including iron intake and exhaust manifolds. "I've always admired the



Sharp eyes may notice the Brougham's rear body lines differ from other muscled Torinos, such as Cobras and GTs. Whereas the latter two were built on the swoopy Sportsroof platform—like the Grabber Blue example seen here—Broughams sprung from the base hardtop (completely different from the Sportsroof aft of the doors).

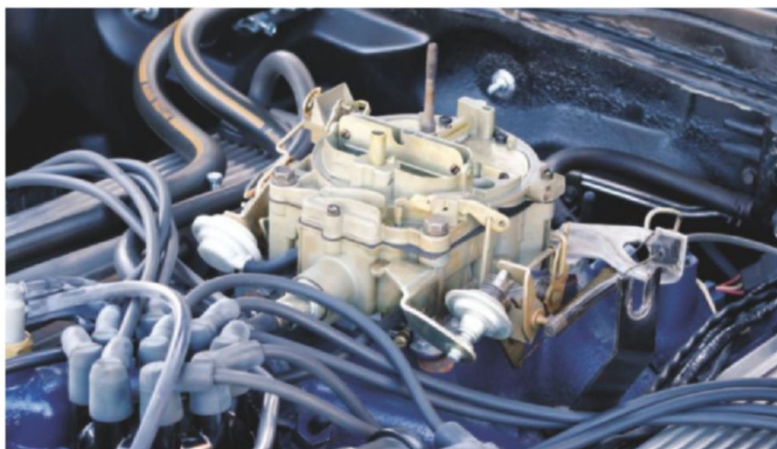






FAST-series muscle cars and their incredible e.t.'s while looking totally stock," Young explains. "I decided to do something similar, yet completely streetable." Purists will squirm when they hear about punching the original block 0.060 over for new Icon forged pistons, or the fitting of a 4.30-inch stroke Scat crank to the original block—the combination resulting in 528 glorious cubes.

Young's first time out at Pacific Raceways in Kent, Washington, netted a 13.28 at 107, but it's easy to believe 12s will be a simple task from here. Factory-style Goodyear Polyglas tires are next, as is some simple tuning that was ignored on initial shakedown passes. Young is more than happy with the results of the engine makeover and completely unconcerned about being everything to everyone. In our eyes, however, this Torino is just right.





## TECH NOTES

**Who:** Kevin Young

**What:** 1970 Torino Brougham, 429 CJ/four-speed

**Where:** Redmond, WA

**Engine:** The 429 is a member of Ford's 385 series of big-blocks (think 460), whose generous bore spacing, deck height, and crankcase make building big strokers a breeze. In this case, 528 ci comes from a 4.423-inch bore and 4.30-inch stroke—the block and crank requiring no clearance grinding. Scott Johnson ported and flowed the factory CJ heads, screwed together the 10.0:1 compression short-block, which includes a Scat crank and H-beam rods, and fitted a custom solid lifter cam from Delta Camshafts (0.591/0.611-inch lift, 244/252 degrees duration at 0.050, and lobe separation of 112). Cliff's High Performance massaged the 750-cfm QJet specifically for the stroker application.

**Exhaust:** Factory CJ exhaust manifolds were Extrude-Honed and then metallic ceramic coated. This led to a custom 2½-inch system with extra-large Walker turbo mufflers for a stealth sound.

**Transmission:** Young couldn't go wrong with a Hurst-shifted close-ratio Toploader four-speed, particularly when it's original to the car. A Center-force clutch and flywheel were added



to the mix while the engine was out for its build.

**Rearend:** Like many Ford muscle cars, this Torino came standard with a 31-spline, nodular-cased 9-inch. Stock 3.50:1 gears have been replaced with 4.11s and a Traction-Lok dif. Factory staggered shocks help defeat wheelhop.

**Suspension:** It is stock.

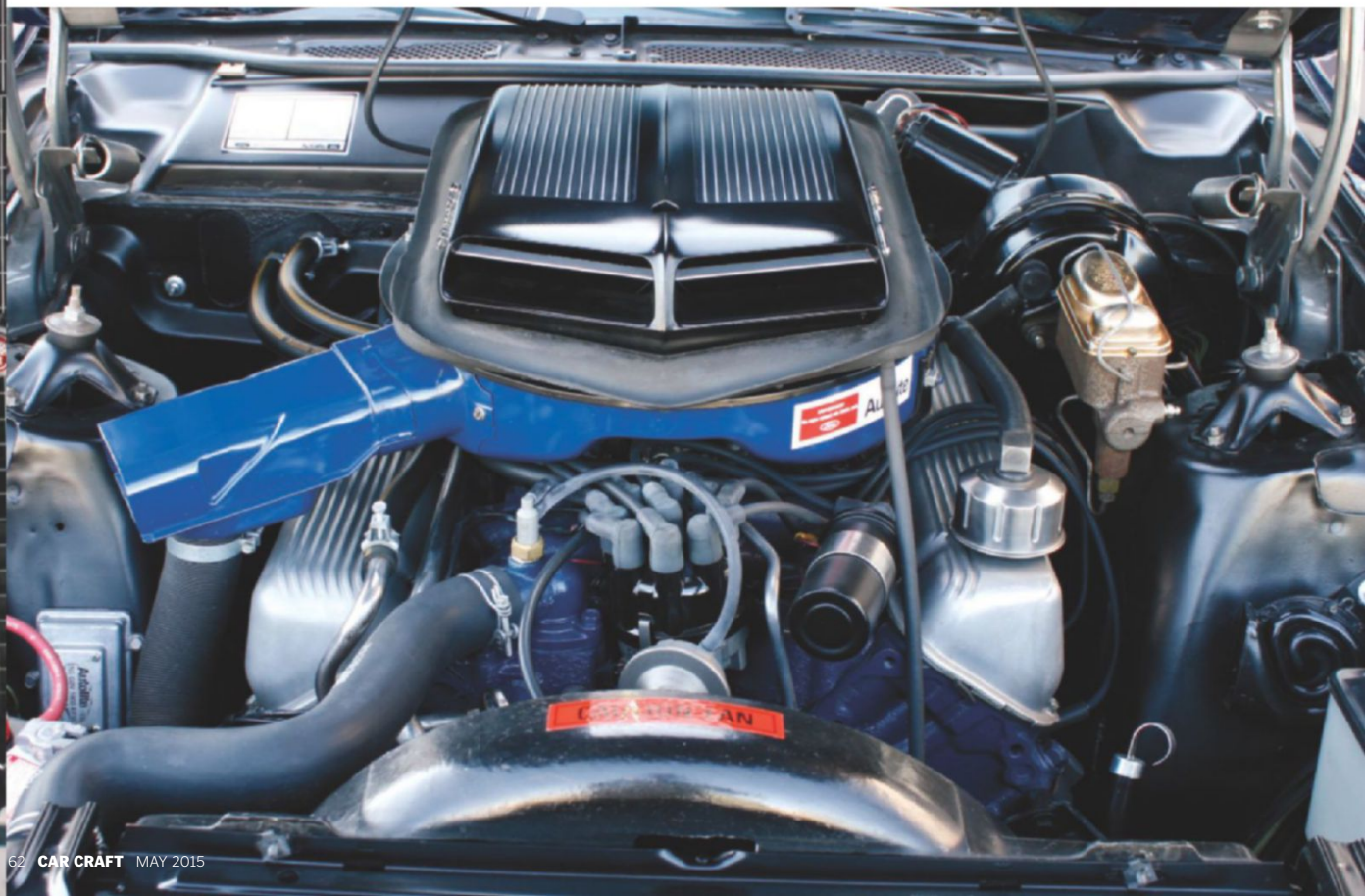
**Brakes:** The stop comes from stock front disc with EBC pads and stock rear drums.

**Wheels/Tires:** These are Ford replica 15x7- and 15x8-inch Magnum 500s with 235/60R15 and 255/60R15 BFGoodrich Radial T/A tires.

**Interior:** Broughams featured

woodgrain interior appointments and upgraded upholstery, a mix of original and restored in the case of this 86,000-mile example. Young tells us the optional ribbon tach near his left knee is virtually useless when running hard, so he fashioned a subtle shift light by hooking up his Summit ignition box to trigger the factory seatbelt-warning light at 6,200 rpm.

**Exterior:** The Torino was treated to a single repaint in the original Dark Blue by a former owner in 1986. Cobra Jet Torinos didn't come standard with Ram Air, but Young's car did—evident by the awesome-looking shaker hood scoop. Likewise, hideaway headlights were optional. **END**





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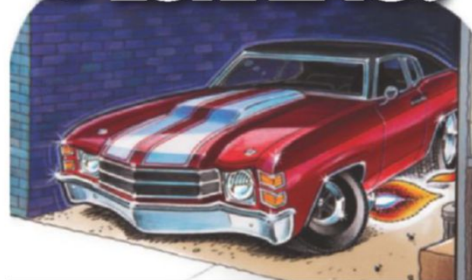
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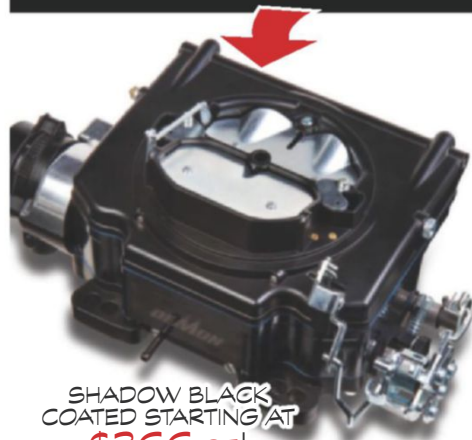
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# SLP'S

By Andrew Nussbaum / Photos: Andrew Nussbaum

# TUNER GTO



## Starting Life as SLP's Bobcat Pilot Car, This 2004 GTO Prowls the Next Decade in Obscure Rarity

In the 1960s, there existed a very special Pontiac dealership in Royal Oak, Michigan. Owned by Ace Wilson Jr., Royal Pontiac offered some of the fastest, best-performing, and most-sought-after Pontiac GTOs of the era. Even before the appearance of the GTO option on the 1964 LeMans, Royal Pontiac offered special tuning packages to improve upon the already impressive performance of Pontiac's 389- and 421ci engines. Customers could either purchase the go-fast goodies for DIY installs or have the dealership do the wrenching.

The name given to the modified cars was "Bobcat," born from combining letters from Pontiac's fullsize Bonneville and the Catalina. Using tried-and-true hot-rodding techniques, the Royal Bobcat cars were massaged to make more horsepower. The Bobcat package included a lower-restriction air cleaner, open hood scoops (as applicable), a Ram Air pan, richer carburetor jets, a 0.027-inch copper head gasket (held over from Pontiac's Super Duty era) for more compression, and weaker springs in the distributor (36 degrees all in by 2,400 rpm) equating to an additional 30 to 50 hp.



# PONTIAC



Forty years after the first GTOs made their mark on the streets and in muscle-car folklore, Pontiac was ready to bring the Goat back to its former glory. Although Royal Pontiac was a thing of the past, many tuning companies thrived in the new age of computer controls and electronic fuel injection. Best known for its Firehawk packages adorning the fourth-gen Firebird Formula and Trans Am, SLP (Street Legal Performance) of Toms River, New Jersey, saw the opportunity in supplying its proven performance parts and hot rod know-how to the new Goat. In honor and recognition of the prowess of the Royal

Pontiac-modified vehicles, SLP chose to introduce its own Bobcat performance package for the new 2004 GTO.

Early in 2005, Robert Hamblen of Wayne, New Jersey, was in the market for a used 2004 GTO. A longtime Goat aficionado and member of the Garden State GTO club, Robert wanted the new model for more regular use in place of his 1970 GTO. Being a GTOAA club member, Robert built a friendly relationship with Jim Salerno, who is a GTO guy and was the owner of Jim Salerno Pontiac in Randolph, New Jersey.





Robert mentioned to Jim that he was looking for a pre-owned, yellow 2004 Goat and to keep him in mind. Robert had little confidence that such a rare car would be available used after only a year's production, but his shallow pockets ruled out the purchase of a new one.

As fate would have it, Jim Salerno contacted Robert by the fall of 2005 with some interesting news. A very special, yellow 2004 GTO was available from SLP for sale through Salerno Pontiac. Intrigued, Robert was told of the brief, yet important, history of this particular Goat. From 2004 to 2005, SLP used the GTO as a test bed for its 421 Bobcat package and a host of performance parts. With the 421 denoting crank-rated horsepower (not cubic inches, like in the old days), pilot car No. 1 (experimental car X03) was fitted with various engine, exhaust, and cam combinations, including SLP's short-block ZL-402 topped with LS6 heads, a Fast intake, six-piston Wilwood brakes, various suspension pieces, and custom tunes. The car was thoroughly flogged on tracks from Michigan to English-town during the R&D stage of its life, but was now ready to be released from service and sold for \$10,000 less than the price of a brand-new Goat—and the 421 Bobcat goodies were free. Robert signed on the bottom line and took possession of his super-rare, new-age Bobcat GTO.

Robert quickly fell in love with it. Even in standard guise, the muscle coupe proved a match for even the priciest competition from Europe and





Japan. The 421 Bobcat bolt-ons only added to the impressive traits of the new GTO. Robert says he "loves to turn the key and feel the car shake to life." He also likes the much-maligned sleeper styling of the 2004 GTOs, saying, "They are not over the top."

Over the past decade, Rob has reveled in his Goat's grand touring prowess, taking the yellow GT car on many long road trips. Whether cruising to upstate New York with his lovely wife, Victoria, rolling into Oktoberfest at Hunter Mountain, stalking the local cruise night, making a ground-shaking appearance at the steakhouse, or attending regional GTO shows, the driving excitement has been immeasurable. "This thing really shines on the winding roads. There's nothing like rowing through the six-speed and listening to the rumble of the exhaust," Rob says.





Becoming a dad and running his successful A/C company definitely cuts into the time he'd like to be putting the GTO through its paces, so Rob cherishes every chance to get his Goat out of the garage and on the highway to really stretch its legs: "Putting the hammer down really makes you feel like the king of the road," he says—and isn't that the whole point? Rob has shared his passion with his dad, now 82, driving up to Vermont for visits to a local cruise-in. He has introduced his four-year-old son, Alexander, to the loud, yellow machine, indoctrinating the next generation of GTO fan. As caretaker of this one-of-a-kind muscle car, Robert has done a great job keeping the 19,000-mile Goat in near-mint condition. Rob has no plans to change or add anything to his modern factory hot rod, a testament to its rarity and SLP's expert touch.

There can be little doubt that, like the Royal Bobcat cars from Pontiac's heyday, Rob's SLP Bobcat GTO is destined to become a timeless American muscle classic. In the meantime, Rob plans to enjoy his rare and powerful beast to the fullest.

## TECH NOTES

**What:** 2004 Pontiac GTO

**Owner:** Robert Hamblen

**Where:** Wayne, NJ

**Engine:** Robert's GTO came equipped with its original 5.7L LS1 still factory fresh with only 50 non-test miles. The 421 Bobcat engine options include a deeper-breathing SLP Blackwing air filter, 85mm mass air sensor, and a 160-degree thermostat. Providing increased valve opening are 1:85:1 ratio rocker arms with 1.25-inch springs and titanium retainers. Freeing up extra horses while limiting parasitic loss is an SFI 25 percent underdrive crankshaft pulley. Exhaust duties are handled by stainless steel 1¾-inch primary long-tube headers with 3-inch collectors and an X-pipe, Loudmouth II modular catback, and twin slash-cut stainless tips. Engine management is dialed in by a custom SLP tune and all six gears are engaged through a B&M shifter.

**Body:** Nicely integrated and fully functional intake slits on the SLP hood give a hint to the hidden power of this Goat. That and the Bobcat 421 badges are the only giveaways.



**Suspension:** Benefiting from this car's unique beginnings, Rob's Goat acquired some very choice suspension upgrades present but not directly part of the Bobcat Package, including a stronger strut tower brace, progressive rate lowering springs with rear camber kit, and heavy-duty rear sway bar with higher durometer bushings. Also present, a lightweight aluminum skidplate and line-lock kit hinting to the hard-core setups from the car's test-and-tune days.

**Interior:** Still appearing and smelling new, the cockpit remains stock, featuring color-coordinated gauges, beautiful GTO embroidered seats, and ample Blaupunkt sound. **END**





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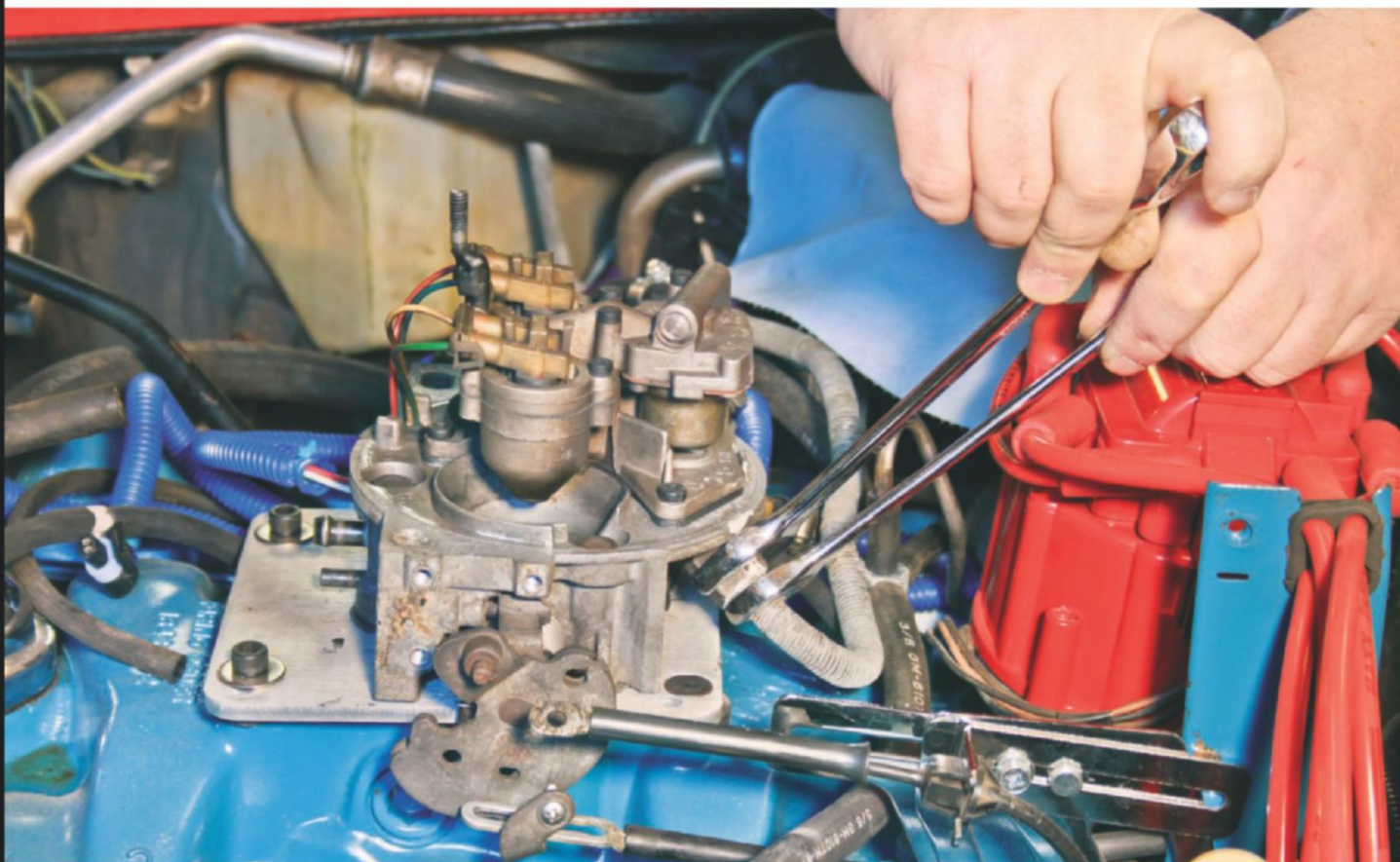




# JUNKYARD BUILDER

## A Homemade TBI Conversion for \$904

By Barry Kluczyk / Photos: Barry Kluczyk and Leonard Slebodnik



**H**ey, we love carburetors as much as the next gas monkey, but it's hard to beat the driveability advantages of electronic fuel injection. Even if an EFI system doesn't necessarily deliver a performance advantage, it pays dividends when it comes to starting, idling, and efficiency. That's particularly true for cars that aren't driven daily.

Such was the case with our buddy Leonard Slebodnik's 1977 Corvette, which was a fair-weather car that was stored during the winter months at his Michigan home. The Quadrajet was gummed up, making even a quick drive a trying, smelly affair, and one that his wife understandably wanted no part of. He briefly considered having the Q-jet rebuilt, but realized he wanted fuel injection. "I really wanted the

assurance that, when I jumped behind the wheel, that the engine would fire up and idle correctly every time," he told us. "A new or rebuilt carb seemed only like a temporary fix for me."

While there are various injection conversion systems on the market, Slebodnik is a do-it-yourself kind of guy and wanted to see if he could do it from scratch for less than \$1,500 (a Q-Jet rebuild is typically \$400-\$500). It would involve some parts scrounging, an electronic controller for the system, and a bit of welding. Slebodnik is in no way a professional tuner, and this project represented his first time ever tackling air/fuel tables on a laptop, but he is blessed with a diagnostically inclined brain, which proved to be a big help. "If I could do it, just about anyone could," he says. "[Swapping]

the parts is pretty straightforward, but you have to be really careful and diligent with setting up the tables with the controller software, and you should have a basic understanding of what the engine needs for proper operation."

The homemade system is directed by the venerable MegaSquirt EFI controller, which we've seen on everything from budget conversions, such as Slebodnik's, to mega-dollar drag-race combinations. It's designed for stand-alone systems, driving only the engine's injection system. It is also designed to be used with a speed-density air metering system, which is what the GM TBI units used anyway.

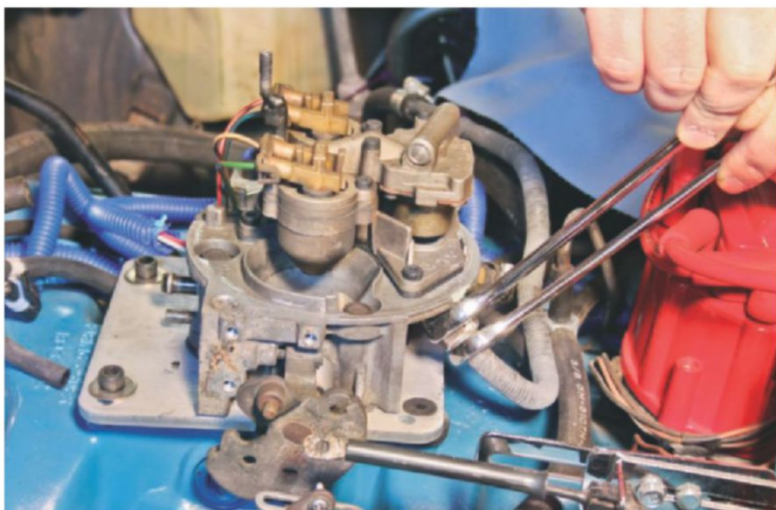
And here's the project's kicker: It was done for only about \$900. Seriously.

We should note, too, that while this project was performed on a wheezy,





Let's dive right in with the removal of the Quadrajet on the original 350 engine. As is the case with many enthusiasts who don't use their "hobby" car as daily transportation—and store it during the winter—driveability suffered for the owner.



A  $\frac{3}{8}$ -inch fuel line rated for high-pressure fuel injection is required to feed the TBI unit. That means running an all-new fuel line from the tank to the TBI. Slobodnik also grabbed some of the flexible hardline shielding for the fuel line from the salvage-yard engine.



The TBI unit used for the project is simply a salvage-yard part scavenged from any of the millions of GM trucks built from the mid-1980s through the mid-1990s, including the 4.3L V6, 5.0L and 5.7L small-blocks, and even the 7.4L big-block (the 7.4L units require larger-bore adapter plates). This one came from a 4.3L S-10 (with a pair of 45-lb/hr injectors) and was purchased at a pull-your-own junkyard for only \$35. It's important to make sure the TBI unit still has the throttle position sensor (TPS) and idle air control valve (IAC). In addition, a couple of coolant temperature sensors are required, so they should be grabbed from the same donor engine. For safety's sake, it's a good idea to replace the TBI unit's gaskets and seals. It's cheap and easy insurance.



While the project car's cast-iron intake manifold was suitable for adapting the throttle-body injection system, owner Leonard Slobodnik picked an aluminum intake from a 1980s-vintage Monte Carlo SS off the shelf of a buddy's garage, where it had been collecting dust for 20 years. A quick clean-up and rattle-can re-spray to match the 1977 engine color delivered an undetectable enhancement that took about 10 pounds off the top of the engine.

smog-era Corvette that was painted the worst color ever (no wonder he didn't want to spend big money on it), the basics apply not only apply to any old GM vehicle but also to just about anything equipped with a carburetor.

## COLLECTING PARTS AND GETTING DIRTY

Before diving into this project, Slobodnik spent considerable time on the Internet researching the project. He found sites and forums, specifically MegaManual.com and Mesfi.com, where others had attempted the same basic conversion and offered advice on the necessary parts, installation, and tuning. With a materials list in hand, he started scouring auto-parts stores, the Web, and a few salvage yards for the components. The basics included:

- MegaSquirt controller, relay board, pre-built cable, and labeled wiring from DIYautotune.com.
- Throttle-body fuel injection from a 1988–1993 GM truck.
- Adapter plate for the intake manifold.
- High-pressure external fuel pump and fuel filter from a late-1980s Ford F250.
- Fuel lines and clamps rated for high-pressure fuel injection.
- LC1 wideband oxygen sensor from Innovate Motorsports.

Removing the original Q-jet and replacing it with the throttle-body apparatus is a comparative snap. The project gets more involved when it comes to routing and connecting the necessary fuel-return line from the throttle-body system to the fuel tank. Although the tank itself doesn't necessarily require modification, the removable section that contains the fuel fill inlet and sending unit does, including a bit of welding. It also means removing the fuel tank, as well as bolting on the





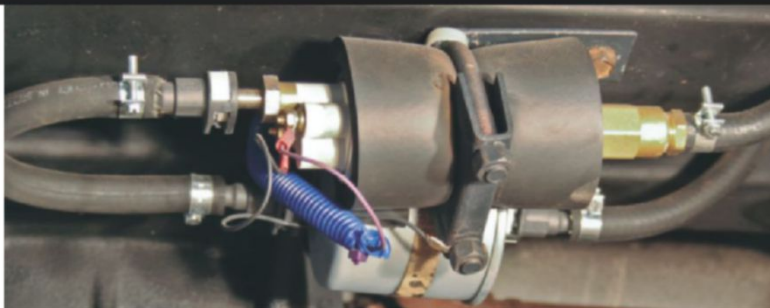
An adapter plate is required to mount the two-barrel-type throttle-body injection unit to the four-barrel manifold—and that's a requirement whether you're working with the stock Q-jet-type spreadbore design or an aftermarket intake with a Holley-style square-bore design. Note the counter-sunk fasteners at the rear of the adapter plate. They're necessary for adequate clearance of the TBI unit. This plate is easy to make, but aftermarket plates are available for about \$50–\$75.



An EFI system requires a return fuel line that's at least as large in diameter as the feed line, which in this case, meant another  $\frac{3}{8}$ -inch line. But here's a cheapskate tip: The original feed line is  $\frac{3}{8}$ -inch and isn't under the pressure of the feed line, so if the original feed line is still in good shape, it can be used for the return line.



To accommodate the larger-diameter fuel return line, this  $\frac{5}{16}$ -inch fitting (arrow) on the fuel-tank sender unit (located at the top of the fuel tank) must be cut off and replaced with a  $\frac{3}{8}$ -inch fitting that is TIG-welded to the sender. The sender is easy to unbolt from the tank, but can get a bit grungy after about 35 years. An alternative is starting with a clean, all-new replacement. This one for the Corvette cost about \$170.



When it comes to sending fuel to the engine, the original block-mounted mechanical pump must be replaced with a high-pressure electric pump—and don't forget the block-off plate for the original pump on the engine. There are a couple of options here: An in-tank pump or an external pump. The easiest path is what Slobodnik took: an external pump (and filter) for a late-1980s/early 1990s Ford F-250 with a throttle-body-fed 7.5L (460) engine. Compared to contemporary port-injection engines that run fuel pressure of about 60 psi, the GM TBI runs with about 12 to 15 psi and the TBI unit features an internal pressure regulator, which is great. But even with this electric pump, it still needs gravity feed, so the pump must be mounted below the tank. Wiring for it must also run to a relay under the hood, but care should be taken, of course, to keep that wiring away from the exhaust system.

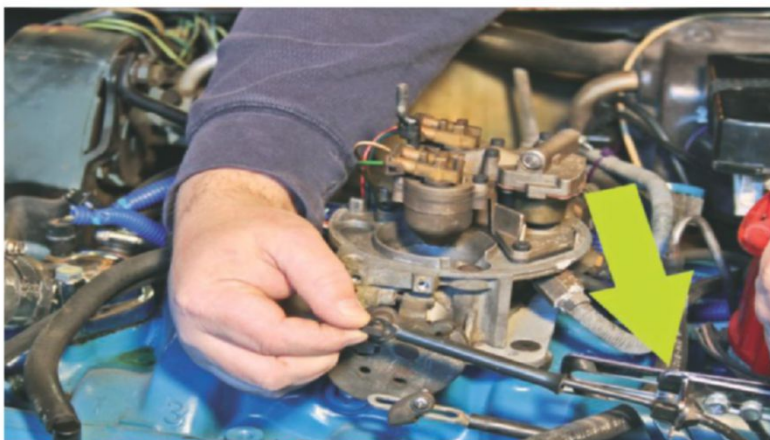
new high-pressure fuel pump beneath the reinstalled tank. The wideband oxygen sensor was essential for tuning, too, but also required welding, as the bung for it was inserted in the exhaust system. The MegaSquirt controller found a home beneath the forward portion of the center console, which provided reasonably easy access for plugging in a laptop for tuning. Room under the hood must also be made for the relay box that supports the injectors and fuel pump.

## TUNING TRIALS AND TRIBULATIONS

Slobodnik had never attempted tuning on a car before, but he is an IT guy by profession, so he knows his way around a keyboard. "Having never attempted anything like tuning for fuel injection before, it was a challenge," he says. "Even though I knew how an engine worked and the basics of air/fuel ratios, I was still starting from zero when it came to getting the car started." Slobodnik points to MegaManual.com and associated forums as invaluable resources. They provide the basics to

program the system enough to get the engine started and idling. And those are the biggest steps. After that, the trial-and-error, fine-tuning process begins.

"One of the hardest things to learn at the beginning was setting the 'constants,' things like the required fuel-injector flow rate, required fuel under acceleration, and the targeted stoichiometric values [optimal air/fuel ratio]," he says. "With those set, you can get the car running, but the variables are almost infinite, so for the first-timer, there's a lot of trial and error. Fortunately, you can save each tune-up as they are created. If it doesn't work as well as a previous one, it's easy to switch back." As we were heading toward the deadline on this story, Slobodnik admitted he was still working on the cold-start enrichment setting, which ensures a cold engine has more fuel until the coolant reaches a set temperature. "Yeah, it's still a bit cold-blooded at start-up, but I'm working on it," he says. "Once that's nailed, it will all be good. As it stands, it already runs much better than with the old carburetor."

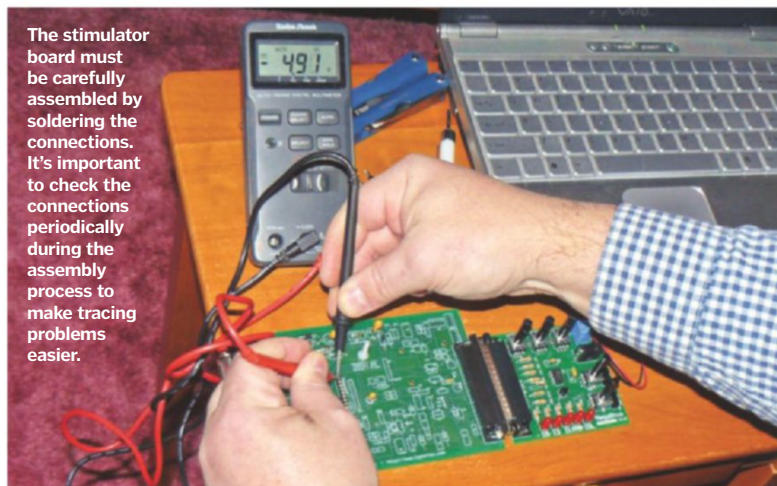


The TBI unit's throttle mechanism is positioned closer to the firewall, necessitating a new, adjustable linkage bracket (arrow). It's available from the likes of Jegs and Summit Racing for only a few bucks, and it simply mounts to the intake manifold.





The MegaSquirt components came from DIYautotune.com, the primary manufacturer and distributor for them. While some very basic, stripped-down components for the system are available for a few dollars less, purchasing a pre-assembled relay cable and pre-labeled wiring kit proved to be a better value, especially for a first-timer. All together, the ECM, stimulator board, relay board, relay cable, and wiring kit cost a mere \$387.



The stimulator board must be carefully assembled by soldering the connections. It's important to check the connections periodically during the assembly process to make tracing problems easier.



After assembling the board, it must be washed with acetone to remove soldering flux that could cause "bridging" problems. Then, the board should be sprayed with a clear lacquer to seal it. That will make it more reliable.



There's no getting around drilling a 1-inch hole in the firewall, because the harness for the controller, which is mounted inside the car, must be connected to the relay board under the hood. There's also a vacuum line to the MegaSquirt controller for the MAP sensor that's mounted on its board.



When it comes to mounting the controller, it should be positioned so that the serial port for the laptop hookup is on the outside for easy access, although it is also easy to run a length of cable from the controller under the console to a discreet location near the rear of the seats for an easier plug-in. The MegaSquirt II and other controllers now incorporate USB ports too.

## THE BOTTOM LINE

Although Sledobnik is still revising his tune to nail down the cold-start performance, he's done spending money for parts on the system. The total—itemized in the accompanying chart—came to \$904. That, of course, doesn't include the sweat equity of doing the installation and tuning himself, but the satisfaction of the project suggests the labor wasn't much of a factor for this project. "There would be a couple things I'd do differently, but I'd definitely do this again on another vehicle," he says. "Even with the couple of tuning issues I'm still working on, the driveability of the car is already much better than with the carburetor. I wouldn't go back to that again for anything." Sledobnik says the experience has also give him a new appreciation and greater understanding for the complexities of modern engines and why tuning is such a painstaking, specialized process. Spoken like a true convert.



The complementing relay board for the control system mounts under the hood. By the way, the three large relays mounted on the board are for the fuel pump (top), injector No. 2 (center), and injector No. 1 (bottom). The injectors used separate relays because they're pulsed (triggered) separately.



One of the recommended options with the MegaSquirt system is paying for the pre-labeled wiring kit, which includes automotive-grade wiring tagged with where each wire should go. It makes installation infinitely easier and a lot faster. But even with that, plan on at least six hours or more to wire-up the engine. Use heat-shrink connectors, too, to ensure weatherproof connections.



With the wiring completed and tucked inside an admittedly cheap-o wire loom, the appearance of the system is tidy and straightforward. As seen here, the TPS, IAC, and coolant temp sensors are connected. What's not visible is the necessary air intake sensor that mounts to the bottom of the air cleaner. A coolant temp sensor can be used for this (that's why two were grabbed at the salvage yard) and installation is as simple as drilling a small hole in the base of the air cleaner and threading in the sensor.





The final sensor to install for the system is a wideband oxygen sensor, which provides specific feedback to the engine controller on the oxygen content of the exhaust gas, rather than the simple lean-or-rich feedback of a narrowband sensor. This enables the engine controller to adjust fuel and—on the MegaSquirt II and other controllers—ignition timing more precisely (the basic MegaSquirt used on this project doesn't allow for easy timing adjustment).



After drilling a pilot hole and the corresponding large hole, a bung for the oxygen sensor is welded to the Y-pipe. The homemade welding job isn't pretty, but it's all that's needed to mount the sensor and connect it to the wiring harness. Ideally, the sensor should be mounted at the top of the exhaust—and ahead of the catalytic converter. Wiring for the sensor is routed to the controller.



Although the installation of the TBI system was relatively straightforward, the most daunting task for the uninitiated comes with actual "tuning" of it. There's no two ways about it: There's going to be trial-and-error adjustments after a baseline program is established. Owner/builder Leonard Slebodnik reports the most difficult aspect is nailing the cold-start enrichment, but patience and incremental revisions will produce the desired results.



The adapter plate and TBI unit combine for a taller installed height than the original Q-Jet, so hood clearance could be an issue on some vehicles. This setup uses an aftermarket air cleaner—with the base offset forward—to mount the air temperature sensor.

## GREATER POWER AND MPG, RIGHT? NOT SO FAST...

Achieving huge gains in performance and fuel economy are common misperceptions with an EFI conversion. Generally speaking, don't expect huge increases in either on an otherwise stock engine. The injection system may foster more-efficient combustion, but it doesn't necessarily translate into noticeably more horsepower. You're looking at maybe a 5 percent increase in horsepower, tops. There are a couple reasons for this: the most notable being the fact that changing to fuel injection doesn't alter the air-flow aspects of the intake manifold or cylinder heads. In this car, we are dealing with low-flowing components typical of 1970s-era small-blocks, so adding EFI to the stock intake and heads won't show much of an increase in power. That's one of the reasons this project uses a "two-barrel"-style throttle-body injection system rather than a "four-barrel"-style. There's simply no need for it on an engine rated at only 180 hp.

As for the fuel economy, again, the car's stock configuration is the compromise: this time it's due to the nature of the three-speed automatic transmission, be it a Turbo 350 or Turbo 400. With the top-gear ratio of 1.00:1 combined that with the typical 3.55 rear axle of the day—in the Corvette, at least—and the highway cruising speed is around 2,500 rpm or greater. Regardless of whether the engine is fuel injected, it's still going to suck gas pretty fiercely on the open road at that engine speed. So if maximizing fuel economy is your goal, go for the overdrive transmission swap after installing EFI.

## DIY FUEL INJECTION BY THE NUMBERS

MegaSquirt ECM	\$147
MegaSquirt stimulator board	\$45
MegaSquirt relay board	\$64
MegaSquirt pre-assembled relay cable	\$85
MegaSquirt sensor wiring kit	\$46
Innovate Motorsports LC1 wideband O <sub>2</sub> kit	\$199
TBI unit and sensors (salvage yard)	\$35
TBI-to-four-barrel intake adapter	\$0 (homemade)
TBI gasket kit	\$30
Fuel pump	\$60
Fuel filter	\$13
EFI fuel hose and fittings	\$60
Air filter assembly and element	\$30
Exhaust adapter and gaskets	\$40
Throttle and kick-down adapter brackets	\$50
<b>TOTAL</b>	<b>\$904</b>

The lack of a nearby chassis-dyno facility in Slebodnik's rural hometown prevented us from securing before-and-after testing of the project car, but the seat-of-the-pants evaluation demonstrated excellent driveability, with crisp throttle response and no hesitation, stumbling, or other issues experienced with the tired original carburetor. Better still was the total cost: \$904. **END**



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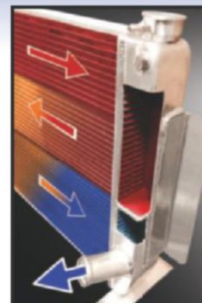
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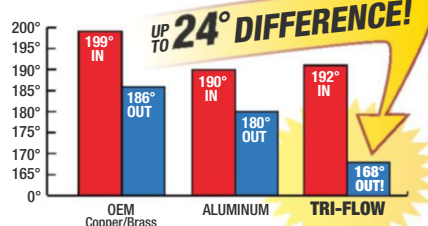
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# WTF? (WHERE'S THE FUN?)



## A BUICK FROM OLDS

**Who:** Roger Odorizzi

**What:** 1964 Buick Special convertible

**Where:** Manson, WA

**Why:** Roger went all stereotypical here—he got the Buick from a “little old lady, but she probably wasn’t that old in 1964.” He scooped it up two years ago, the day after Christmas, and manages to drive it three times a week during the “good weather months.”



## FATHER/SON RACER

**Who:** Brad Cox

**What:** 1977 Pontiac Trans Am

**Where:** Westfield, IN

**Why:** We met Brad and his dad at the Street Machine Nationals, and this is their street-legal racer. It has a 470ci Pontiac motor, and the quickest pass it has made is 8.19 at 170 mph. However, expect that to change when the 540ci Pontiac being built gets dropped in.



## LEARNING WRENCHING, WRITING, 'RITHMATIC

**Who:** Frank Jones

**What:** 1966 Dodge Charger

**Why:** We're fans of Frank's Charger, but we're even bigger fans of how he's managed to persuade his granddaughter, Camille, to get her nails dirty and rebuild it. And not even as one of her chores—she's actually already a wee gearhead. Among the things she's learning about? The car's 383 big-block.





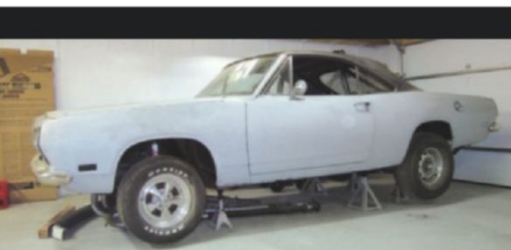
## 'KILL 'BU

**Who:** John Simioni

**What:** 1966 Chevelle Malibu Post

**Where:** Chicago, IL

**Why:** We really don't know how to top that rear personalized license plate—ROADKILL—so we'll just give you the facts: 454 big-block, 12-bolt, 3.73s, T-10 four-speed, oval ported heads, roller rockers, dual electric fans/aluminum radiator, a Holley double-pumper, and Flowmaster out back.



## FROM BARN TO TRACK

**Who:** Eric W. Johnson

**What:** 1969 Plymouth Barracuda notchback

**Where:** Dublin, IN

**Why:** This bracket-car-in-progress was a barn find, and it hadn't had a motor in about 20 years. Now Eric is building a 360 and 904 transmission, plus he has added an 8<sup>3</sup>/<sub>4</sub> rear with 4.88 gears and an eight-point rollcage and race seats—gauges are to come. He has his eyes on 11s, so count on nitrous to be on the list of upgrades, too.

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**disclaimer:** If you can't write a complete sentence, don't worry, we will make your work comprehensible. That includes making up stuff we thought you meant. And, sorry, we can't return photos.

**Facebook.com/CarCraftMag**

## →LETTERS



## CLEVER RECYCLING YOU CAN'T UNSEE

Here is a good way to use a set of old connecting rods. I still have a pair to put up to make a towel bar in my shop bathroom. I have never seen them used like this before and thought I would share my idea.

—Dean Skaflen, via email



## TIP FOR TIP

Just got my Feb. 2015 **Car Craft** today and would like to comment on "tech tip" #14 ("29 Tech Tips That Will Save the World"). Concerning the use of grit-impregnated brushes to clean gasket surfaces, you depict a brush being used on an assembled engine, but all the car manufacturers have issued technical service bulletins warning against this practice. As these brushes or discs wear during use, they throw abrasive particles into the engine so they are "polishing" the crankshaft and so on as you drive! Not good! Wire wheels or cup brushes in a drill or die grinder can be bad as well. The OEMs recommend a scraper and elbow grease only!

—Allan Kittleson, via email



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**WTF?**

## IN THE NEWS

### VINTAGE AUTO PHOTOS

Guess what the Detroit Public Library just did?

It made the public library super cool. It now has more than 32,000 photos from the National Automotive History Collection available on the Interwebs. You'll find all sorts of goods, from cars and motorsports to drivers and auto shows. There are also neat manufacturing pics. Go to [DigitalCollections.DetroitPublicLibrary.org](http://DigitalCollections.DetroitPublicLibrary.org) and click on "digital collections." We found classics of things like presidents and cars and early booth babes and cars (really long dress and top hat, ladies?). The collection will keep getting updated.



### BEST SALES NUMBERS SINCE—REALLY?!

The Ford Mustang has hit 50 years old, and apparently these are indeed its golden years, at least in terms of sales. Its November 2014 numbers were the best since 2006. Did you know the Mustang's largest markets are Texas and California? Or that dealers claim the new Mustang is only staying on the lot about eight days before being sold?





## BLOW OFF A SAFETY RECALL NOTICE: NO REGISTRATION RENEWAL

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Photo: GM

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# BURNOUT!!

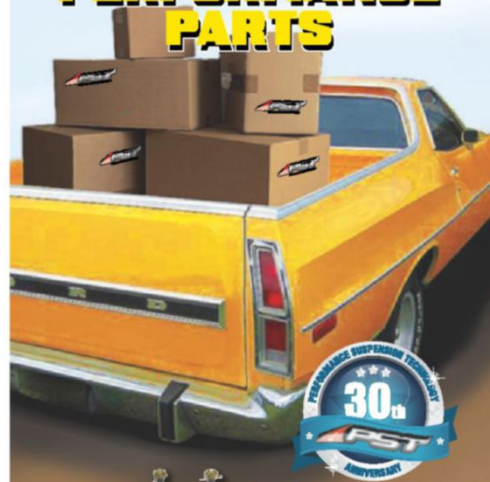


"A picture of me doing a burnout in my 1964 F-100 big-block, sleeper, short-wide-bed truck. The truck has a mild 460/C6 with a 9-inch Ford rear end. I was at a car show called Dillehay Hot Rod Hullabaloo in Danville, Kentucky. Toward the end of the show, people started doing burnouts and I ended up doing a 100-foot-plus burnout on a pinstriped street. A fun little truck that can do endless burnouts."

—Travis Coomer, Louisville, KY



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# REAR VIEW



## THE GASSER LOOK

It's a gasser. Don't let the new guy tell you that your drag car isn't a gasser because it was built after 1955 and doesn't have a Moon tank on the front bumper. Gasser was a NHRA class, and like most drag racing classes, it was derived from modified street cars that ran on gasoline in either Gas Coupe or Sedan. Sky-high front ends and Moon tanks weren't required. Skip Hess was known for his Shores & Hess AA/Gas Ford Anglia but switched to this Mustang in 1968 and ran 8s in gasser trim. At the end of the A/Gasser era, Hess created the Mongoose bicycle company and the legendary MotoMag wheel. Note the B/Gas Chevelle in the far lane.

By Douglas R. Glad / Photos: Car Craft Archives

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